Learning Management Through the Scaffolding Teaching to Improve Learning Achievement for 1st Year of Secondary Vocational Students

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Abstracts

The objectives of this research were to: 1) compare the 1st year of vocational - secondary students learning achievement on the Fundamentals of Computer Application studying through scaffolding teaching to 70 percent criteria, and 2) compare the pre-and post-learning achievement of the students studying through scaffolding teaching. The research sample was 10, selected by purposive sampling, 1st-year vocational secondary students studying the Fundamentals of Computer Application at Zigong Vocational and Technical School, Sichuan, China, in the academic year 2022. The research instruments consisted of: 1) a learning management plan based on the scaffolding teaching, and 2) a learning achievement test. Mean, percentage, standard deviations, and t-tests were used for data analysis. The research results showed that: 1) the 1st year of vocational - secondary students' learning achievement on the Fundamentals of Computer Application studying through scaffolding teaching was higher than the 70 percent criteria at the statistical significance level of .05., and 2) the post-learning achievement of the students studying through scaffolding teaching was higher than the pre-learning at the statistical significance level of .05.

Keywords: Learning Management; Scaffolding Teaching; Learning Achievement

Introduction

Vocational education is an essential part of China's education system which undertakes the critical task of providing professional and technical talents for social and economic development. To promote the quality of Vocational Education in China, the Ministry of Education and other competent departments have issued a series of policy documents in recent years, requiring local vocational education schools to make the greatest use of all kinds of emerging educational ideas, methods, technologies, and tools to strengthen the innovation of teaching models effectively. Moreover, this also improves the teaching quality of vocational education and plays an essential role in professional talent training. (Cheng Xiangqian, 2021: 28)

The emergence of information technology has provided good technical conditions for the innovation of the vocational education model. In 2017, the Ministry of Education issued guideline opinions on further promoting the informatization development of Vocational Education (Hu yunqi, et al**.,** 2019 : 86-87). Later, this referred to the Guiding Opinions. It requires vocational education schools at all levels to actively carry out the innovation and practice of teaching mode based on information environment, transform the traditional vocational teaching mode by utilizing information technology and promote the development of vocational education informatization to depth and breadth. (Li Fang and Shi Yuxin, 2020 : 15)

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Driven by guiding opinions, many innovative vocational teaching models based on information technology have emerged in China.

Generally, the innovation of these vocational teaching modes, information technology mainly provides more efficient and convenient application platforms and tool support for traditional teaching and establishes a teaching system combining online and offline to improve the teaching quality and effect. Therefore, to give maximum play to the advantages of information technology in vocational education, its core is to combine it with traditional teaching. Scaffolding teaching is one of the important practical ways of Constructivism Theory in pedagogy which has been widely and currently used in the domestic vocational education system. (Aslan, 2021 : 237-249)

Based on my teaching practice in a secondary vocational school (from now on referred to as secondary vocational school), this study combines information technology with traditional scaffolding teaching, designs the online scaffolding teaching, and applies it to the teaching activities of the course "Fundamentals of computer application" in the secondary vocational school.

"Fundamentals of Computer Application" is one of the basic introductory courses in secondary vocational schools. The teaching goal is to cultivate students' skills in computer processing, simple information management along with relevant basic computer theoretical knowledge, improve the basic skills of computer application and implement the fundamental spirit of "Employment Orientation" of Vocational Education. Therefore, the course "Fundamentals of Computer Application" is both practical and theoretical since its teaching results substantially impact the smooth employment of secondary vocational students. However, due to the relatively low quality of students in secondary vocational schools, most students' computer application skills and related knowledge reserves are feeble before entering school; meanwhile, the technical and practical requirements of the course itself are relatively high. Therefore, traditional teaching rarely achieves the expected teaching objectives and teachers need to innovate in teaching.

In recent years, many new teaching modes have emerged in teaching. Among these, scaffolding provides personalized teaching, improves students' self-help learning ability, and reduces frustration. Scaffolding teaching draws lessons from the concept of "scaffold" in the construction industry and compares the learning goal to "building." Teachers' teaching is to provide a "scaffold" for constructing this "building" to help students gradually establish and complete the required knowledge and technical structure. (Han Xiao, 2019 : 154-156) In scaffolding teaching, teachers first analyze the teaching objectives, then create the "scaffold" required for learning related concepts and learning framework. The teaching process includes situational creation, independent exploration, collaborative learning, and so on. Finally, it comprehensively evaluates learning achievements, students' autonomous learning ability, and cooperative learning ability which can adopt teacher-student evaluation, students' self-evaluation, and mutual evaluation. The recent development zone can plan and improve the teaching process and scheme in scaffolding teaching. Teachers should help students build and remove "scaffolding" to promote the development of students' knowledge and skill structure. The above-mentioned "scaffold" is necessary for students to successfully pass the recent development zone from the current cognitive development level and reach the potential development level.

Research Objectives

1. To compare the 1st year of secondary vocational students learning achievement on the Fundamentals of Computer Application studying through the online scaffolding teaching whose score reached 70 percent.

2. To compare the 1st year of secondary vocational students learning achievement on the Fundamentals of Computer Application before and after studying through the online scaffolding teaching.

Research Methodology

1. Research Design

The research is pre-experimental of which the experimental design was the one-group pretest-posttest design.

Table 1 The *One-Group* Pretest-Posttest *Design*

pre-test	independent variable	post-test
T_1	X	T_2

Symbols used in experimental design:

X = A learning management through the scaffolding teaching
T_1 = Pretest
T_2 = Posttest

2. Population and Sample

The population in this study was 138 of 1st year of secondary vocational students, studying the Fundamentals of Computer Application at Zigong Vocational and Technical School, Sichuan, China, during the academic year 2022. The research samples were 10, selected by purposive sampling, 1st-year secondary vocational students studying the Fundamentals of Computer Application course at Zigong Vocational and Technical School.

3. Variables: Variables in this research were independent variables and dependent variables. 1) Independent Variable: The learning management through scaffolding teaching and 2) Dependent Variable: Learning achievement on the Fundamentals of Computer Application.

4.Research Instrument

The research instruments were classified into the types as follows:

1)The learning management plan based on the scaffolding teaching in the Fundamentals of Computer Applicationfor8 hours. The course content includes 4topics as follows: 1. The composition of the computer systems for 2 hours, 2. Operation of Windows Operating System for 2hours, 3. Excel Spreadsheets for 2 hours, and 4.PowerPoint: Basic Functions and Features for 2 hours. The IOC value was equal to 0.80-1.00.

2) A learning achievement test on the Fundamentals of Computer Application. The test consisted of 30 multiple-choice questions. The analysis results showed that the IOC value was equal to 0.80-1.00., the difficulty of 0.40 - 0.80, and the discriminating power was between 0.50 - 0.80.

5.Data analysis:

1) Study the analysis of instrument quality.

1.1) The effectiveness of the learning management system and the achievement test on the Fundamentals of Computer Application is evaluated using the Index of Item Objective Congruence (IOC).

1.2) Cronbach Alpha Coefficient; the formula was used to determine the validity of the achievement test with a confidence assessment of the alpha coefficient; the level of difficulty for a learning achievement should be between 0.20 and 1.00; the level of discrimination for a learning achievement should be at least 0.20.

2) Analysis of hypotheses testing.

The process is as follows:

2.1) To compare the students' learning achievement studying through the scaffolding teaching whose score reached 70 percent criteria, this is done through *one*-sample *t-test.*

2.2) To compare the students' learning achievement before and after studying through the scaffolding teaching, this is done through the dependent samples t-test.

Conceptual Framework

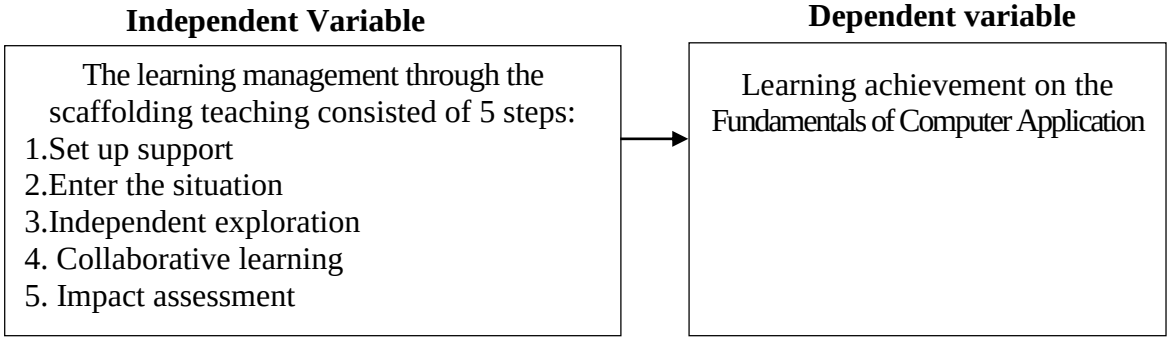

Figure 1 Conceptual Research Framework

Research Results

1. The comparative results of students' learning achievement studying through scaffolding teaching whose score reached 70 % criteria.

This section will also present Tables 2-3 and Figure 2.

Table 1 The results of the student's learning achievement studying through scaffolding teaching.

Number of Students	Learning management through scaffolding teaching			
	Before Study		After Study	
	Score	Percent (%)	Score	Percent (%)
1	16	53.33	26	86.67
2	14	46.67	25	83.33
3	14	46.67	28	93.33
4	13	43.33	30	100.00
5	13	43.33	29	96.67

Number of Students	Learning management through scaffolding teaching			
	Before Study		After Study	
	Score	Percent (%)	Score	Percent (%)
6	13	43.33	28	93.33
7	15	50.00	27	90.00
8	15	50.00	26	86.67
9	15	50.00	26	86.67
10	13	43.33	26	86.67
Mean ($\bar{x}$)	**14.16**	**47.00**	**27.10**	**90.33**
S	**1.101**		**1.595**	

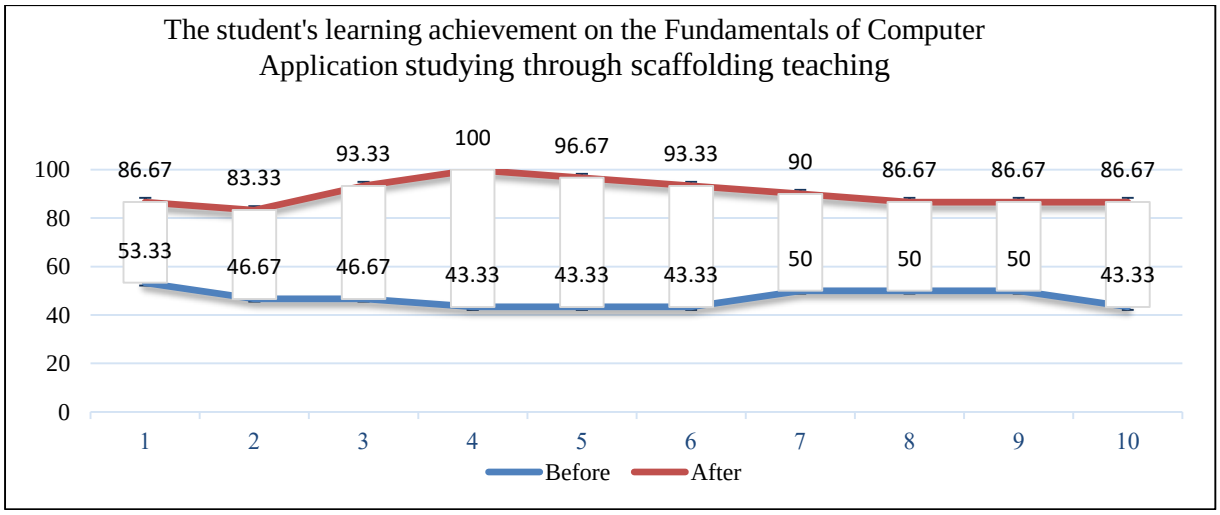

Figure 2 The student's learning achievement studying through scaffolding teaching.

From Table 2 and Figure 2, the results revealed that the before-study test scores of students studying through scaffolding teaching were ($\bar{x}$ = 14.16, s = 1.101) 47%, and after-study test scores were($\bar{x}$ = 27.10, s = 1.595) 90.33 %.

Table 3 The comparative results of the student's learning achievement studying through scaffolding teaching whose score reached 70 percent criteria.

Learning management through scaffolding teaching	(Number of Units) n	Mean ($\bar{x}$)	Standard Deviation (s)	% of Mean	t	Sig.(1-tailed)
After Study	10	27.10	1.595	54.20	-15.66*	0.000

From Table 3, the results revealed that the post-test scores of learning achievement of students were 90.33% ($\bar{x}$ = 27.10, S = 1.595). When comparing the student's learning achievements studying through scaffolding teaching, it was found that the student's learning achievements were higher than the 70% criteria with statistical significance at the.05 level.

2. The comparative results of the student's learning achievement before and after studying through scaffolding teaching.

This section will also present Table 4.

Table 4 The comparative results of the student's learning achievement before and after studying through scaffolding teaching.

Learning achievement through scaffolding teaching	(Number of Units) n	Mean ($\bar{x}$)	Standard Deviation (s)	Computed t-value (t)	Degrees of Freedom (df)	Sig. (p-value)
Before Study	10	14.10	1.101	17.103*	9	0.000
After Study	10	27.10	1.595			

From Table 4, the results revealed that the post-test scores of the student's learning achievement were ($\bar{x}$ = 27.10, S = 1.595) higher than the pre-test ($\bar{x}$ = 14.10, S = 1.101). When comparing the student's learning achievement studying through scaffolding showed that the after-study scores were higher than the before-study scores statistically significant difference at the level of.05.

Discussion

1.The comparative results of the student's learning achievement studying through scaffolding teaching whose score reached 70 percent criteria showed that it was higher than the 70 percent criteria with statistical significance at the .05 level. This may result from the scaffolding teaching emphasizing the student-centered teaching idea. However, it has obvious effects on the cultivation of students' practical problem-solving abilities and autonomous learning abilities. In scaffolding teaching, teachers need to draw up a complete teaching plan and provide students with learning tips and clues step by step. (Wang Liqun, 2021 : 183-185). According to Laetitia's (2020 : 157-173) study about the application of the scaffold teaching method in computer teaching, scaffolding teaching is the systematic construction of scaffolding for students under the direction of teachers and gradually tearing down the scaffolding as students develop their capacity for independent exploration. Both the directing function of teachers and the gradual elimination of teacher guidance are highlighted during the application process of this strategy. The ultimate objective is to help students become even more adept at exploring on their own, give them the ability to comprehend and build information on their own, and completely change the learning process from one that is teaching-centered to one that is learning-centered. The findings of Elizabeth, et al., (2017 : 80-86) who studied online Computer education course based on scaffolding teaching theory found that a conceptual framework for students' knowledge acquisition was created in their zone of proximal development, allowing students to create meaning for themselves in social interactions to solve a task problem, gradually acquiring new knowledge and mastering potential development skills in the process by creating scaffolding inside the students' closest development zone, teachers assist students in crossing the nearest development zone and reaching potential development levels during the teaching process. Scaffolding teaching is very suitable for course teaching that emphasizes students' practical ability and problem-solving abilities (Luo Li, 2020 : 243-245). The study confirmed the effectiveness of scaffolding as stated by Dar, et al., (2019: 79-92) that students exposed to the scaffolding strategy performed significantly better than their

counterparts who were exposed to the traditional method; for this reason, the students scored higher than 70 percent according to the assumption.

2. The comparative results of the student's learning achievement before and after studying through scaffolding teaching showed that the student's after-learning achievement studying through scaffolding teaching was higher than the pre-learning at the statistical significance level of.05. This may be caused by the scaffolding of teaching because the student's academic performance is significantly higher than their previous performance. Therefore, scaffolding teaching can significantly improve students' academic performance. Scaffolding teaching splits curriculum knowledge to form the basic elements required for teaching activities and then provides corresponding tools and structural support for students to learn the split knowledge with the assistance and guidance of teachers. (Lu Yuying, 2019: 32-34). In congruence with the application of scaffolding teaching to information technology classroom teaching, it has changed the traditional information technology teaching method, highlighted the main position of students, and promoted students to construct a knowledge framework. In the classroom, students change from passively accepting knowledge to actively acquiring knowledge and enhancing their learning enthusiasm in the process of collaborative learning and inquiry activities. Teachers have changed from being the leader of classroom teaching to being the observer of student learning, assisting students in completing exploratory learning, and promoting students' confidence in learning. The transformation of classroom teaching forms has enabled every student to participate in classroom learning, giving students more learning opportunities (Wang Lixin, 2021: 19-20). Therefore, through the application of scaffolding teaching, students' scores in the Basic Computer Application course have been significantly improved, and higher than before.

Suggestions

1.Suggestions for applying the research results

1.1) The application of scaffolding teaching has played a certain role in improving the current teaching situation of the "Computer Application Foundation" course in secondary vocational schools, specifically manifested in the following aspects: Firstly, in the teaching loop of creating scenarios, teachers effectively stimulate students' interest in learning and improve their focus on learning by combining situations that are able to resonate with students with new knowledge to be learned; Secondly, students can effectively improve their self-ability by completing a series of small learning tasks assigned by the teacher during the autonomous exploration process. Moreover, in group collaborative learning activities, students not only learn from each other but also exercise their language expression and cooperation skills. In summary, compared to traditional teaching, the use of scaffolding teaching in the "Fundamentals of Computer Application" curriculum in secondary vocational schools can effectively improve students' academic performance, thereby verifying the experimental hypothesis.

1.2) The application of scaffolding teaching has improved the classroom teaching effect of the "Computer Application Foundation" course in secondary vocational schools to a certain extent. Although from the actual situation, secondary vocational school students' basic knowledge and abilities in computer application are relatively weak, by providing them with timely and appropriate learning scaffolds, teachers can promote students' deeper understanding and mastery of new knowledge and improve their learning effectiveness and performance. At the same time, after analyzing the learning tasks assigned in each class and the quality of the

work after class, it can be significantly seen that students have mastered the content learned in class. Comparing the classroom learning quality and final test scores of the experimental group and the control group, it is not difficult to see that students' learning ability and efficiency have improved to a certain extent, and their performance in mastering knowledge points and application abilities in the "Fundamentals of Computer Application" course is better than that of the control group.

1.3) Scaffolding teaching can improve the current situation of information technology teaching in secondary vocational schools by stimulating learning interest, cultivating collaborative learning ability, and autonomous exploration ability, and also have a beneficial impact on teaching effectiveness, thereby providing some beneficial enlightenment for the classroom teaching practice of the "Computer Application Foundation" course in secondary vocational schools. To promote scaffolding teaching, it is necessary to cultivate the educational concepts of information technology teachers in secondary vocational schools. Currently, most secondary vocational school’s teachers say they have never heard of this teaching, which greatly limits the breadth and depth of the application of scaffolding teaching in the teaching of courses such as "Fundamentals of Computer Application". Therefore, in the future teaching practice, from the perspective of secondary vocational schools, it is also necessary to continuously strengthen teacher education concepts and ability training, so that teachers can learn the principles and processes of scaffolding teaching, to ensure that scaffolding teaching achieves better teaching results.

2.Suggestions for future research

For further research, the topic should be focused on: 1) the learning management through scaffolding teaching to improve other skills or competency, and 2) learning management through the scaffolding teaching combination with teaching method to improve the learning achievement or skills of students.

References

Aslan, A. (2021). *Problem-based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction*. Computers & Education, 171 (104), 237-249.

Cheng, X. (2021). *Reform plan of computer network technology and Application Curriculum*. Computer. (14), 28.

Dar, F. R., and Asad, M. (2019). *Scaffolding English Language Teaching through Technology.* Journal of Education & Social Sciences. 7 (2), 79-92.

Elizabeth, A. S. and Amy, D. B. (2017). *Authenticity, relevance, and connectedness: Graduate students' learning preferences and experiences in an online Computer education course.* The Internet and Higher Education. (32), 80-86.

Han, X. (2019). Characteristics of SMRT Computer teaching program -- Take Harbin Guangxia College as an example. *Journal of Jiamusi vocational college*. (09), 154-156.

Hu, Y., Li L., and Wang X. (2019). *Literature review on Scaffolding Teaching in Chinese universities.* China Press. (21), 86-87.

Laetitia, M. (2020). Scaffolding Content in an Online Content and Computer Integrated Learning (CLIL) Module. *International Journal of TESOL Studies*. 2 (2), 157-173.

Li, F. and Shi Y. (2020). The practice of Online Computer Network Course Teaching Reform [J]. *RTVU Science and Engineering*. (04), 15.

Luo L. (2020). Improving the quality of online education with Scaffolding Teaching Mode taking high school information technology as an example. *Information and computer (theoretical Edition).* 32 (06), 243-245.

Wang, L. (2021). *Research on Scaffolding Teaching Strategy of Practical Computer Technology in senior high school*. Computer teacher. 21 (24), 183-185.

Wang, L. (2021). *The application of Scaffolding Teaching in senior high school writing teaching.* Anhui Education and scientific research. (36), 19-20.