The Reform and Practice of Independent Cooperative Learning Model Based on ADDIE Model in Teaching Secondary Vocational Courses
Take "Computer Application Fundamentals" Course as an Example

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Abstract. At present, the autonomous and cooperative learning mode is widely used in teaching, and the application of this method in the teaching of secondary vocational "Computer Application Fundamentals" can break the shackles of the traditional teaching mode and effectively improve the teaching quality. Firstly, this paper analyzes the problems existing in the course teaching of "Computer Application Foundation", and puts forward the application of the independent cooperative learning mode based on ADDIE model in the course teaching of "Computer Application Foundation" in secondary vocational schools. Then, it takes a chapter of "Computer Application Foundation" in secondary vocational schools as an example to design and practice the independent cooperative learning mode. Finally, it makes a comparison experiment with the traditional teaching mode class and uses SPSS software to analyze the data, and the final result is good.

Keywords: ADDIE Model · Self-directed cooperative inquiry · Computer Application Fundamentals · Course Teaching · SPSS Software

1 Introduction

The ADDIE model refers to a systematic approach to the development of teaching and learning [1]. Self-directed and cooperative inquiry is a creative and effective teaching theory and strategy that emerged in the United States in the early 1970s and made substantial progress in the mid-1980s, and is currently a mode of education and teaching used in many countries [2]. At present, there are still many problems in the teaching of secondary vocational "Computer Application Fundamentals" course, and the teaching mode still mostly adopts the traditional teaching mode, which generally causes the poor teaching effect of the course. The purpose of "Computer Application Foundation" in secondary vocational schools is to enable students to exercise their practical computer operation ability on the basis of learning the basic theoretical knowledge of computers, and to lay a good foundation for learning computers. Therefore, it is urgent to find an

effective teaching mode and apply it to this course. In order to reform the existing teaching of Computer Application Foundation in secondary vocational schools, this paper puts forward the application of the independent cooperative learning mode based on ADDIE model in the teaching of Computer Application Foundation in secondary vocational schools, and makes a comparative experiment with the traditional teaching mode. The data is analyzed by SPSS software, and the final test result is good. The purpose of this paper is to improve the teaching quality of this course, stimulate students' interest in learning, make them better master the basic computer knowledge, and further improve their ability to analyze and solve problems.

2 The Existing Problems in the Teaching of Computer Application Basis in Secondary Vocational Schools

2.1 Teaching Materials and Pedagogy

According to the "Computer Application Foundation Syllabus" published by the Center for Vocational and Technical Education, the textbooks used in most secondary vocational colleges and universities for the "Computer Application Foundation" course are generally too old, and the textbooks used by some schools have not been changed for many years, so they have not been able to keep up with the development of the rapidly changing computer technology and do not meet the needs of the fast-developing society in the information age. The quality of teaching will be affected if the textbooks are updated too quickly or too slowly.

From the point of view of teaching methods, many secondary vocational colleges still haven't deviated from the traditional teaching methods, nor have they highlighted the strong practical teaching characteristics of the course. Students lack the ability to learn and understand knowledge independently and cooperatively, which leads to many secondary vocational students' better understanding of computer terms, concepts, principles, etc., but their actual computer operation ability is poor.

2.2 Teaching Principles and Teaching Model

1) Issues of Teaching Principles: The public basic course of "Computer Application Fundamentals" offered by secondary vocational colleges and universities largely continues to follow the traditional teaching mode in which the teaching subject is the teacher, the teaching center is the classroom, and the textbook is the main learning carrier. The purpose of education and teaching is only to transmit knowledge, and the old teaching concept is the biggest bottleneck for reform and innovation of teaching mode and teaching methods.
2) Teaching Model Issues: The traditional teaching model has formed a one-way teacher indoctrination, students passively accept the learning mode, the teacher in the classroom just "instill" knowledge to students [3], both from the course preparation and to the course lectures are teacher-oriented, the teacher lacks the cultivation of students' independent cooperative learning ability, fails to pay attention to student trends in a timely manner, and cannot effectively convert students' passive acceptance into students' active inquiry learning and extend to cooperative inquiry learning with their peers [4].
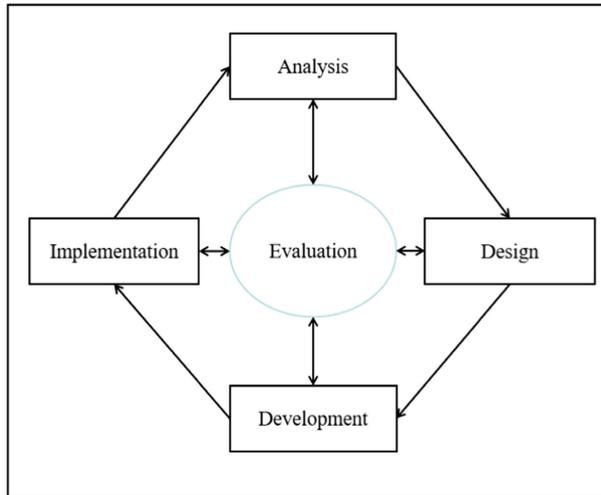
Fig. 1. ADDIE model diagram

3 Introduction of ADDIE Model and the Importance and Advantages of the Independent Cooperative Learning Model Based on ADDIE Model Applied to the Teaching of "Computer Application Foundation" Course

3.1 ADDIE Model Introduction

The five letters of ADDIE stand for: Analysis, Design, Development, Implementation, Evaluation, which constitute the ADDIE curriculum development model, as shown in Fig. 1. In this process mainly contains: what to know (Analysis), how to learn (Design), what are the specific learning steps (Development, Implementation) and how to know whether the learners learn (Evaluation) [5].

3.2 Importance and Advantages

ADDIE model provides a set of scientific, systematic and structured curriculum development process guidelines for curriculum development, and the task is completed step by step according to the steps of the model, and the logical structure of the whole curriculum development is clear and organized, which is highly instructive for teachers' teaching, and it is easier to grasp the teaching points and effectively improve the teaching of the curriculum by applying this model to teach the curriculum under the conditions of insufficient experience in teaching the curriculum It is easier to master the teaching points and improve the efficiency of course teaching under the condition of inexperience in course teaching [6]. In addition, applying it to the teaching of the course can effectively improve the systematization and orderliness of the course. It enables you to jump from the unfree kingdom to the free kingdom, i.e., it is more applicable and can be applied to different kinds of curriculum development or curriculum teaching.

"Computer Application Foundation" in secondary vocational schools is a public basic course, which plays a very important role in the teaching system of secondary vocational schools [7]. "Computer Application Foundation" is a basic subject with both knowledge and skill [8]. The traditional teaching mode of pursuing basic knowledge can't meet the rapid development of computer technology. Therefore, it is necessary to reform the teaching mode of computer application foundation course. Moreover, the current new round of education reform carried out in China also advocates changing students' learning style and advocating independent, cooperative and inquiry learning style [9]. The implementation of the ADDIE model-based independent cooperative learning teaching model in the secondary vocational "computer application fundamentals" course can help secondary vocational students better master the "computer application fundamentals" course, and lay a solid foundation for future learning of computer programming, computer-aided manufacturing, and computer office [10]. It allows students to develop themselves more comprehensively in independent cooperative inquiry learning, really makes students become the master of learning, transforms students' passive acceptance into students' active acceptance, allows students to learn to learn independently, cultivates cooperative team spirit, and thus achieves the goal of students' lifelong learning [11].

4   The Process of Applying the ADDIE Model-Based Independent Cooperative Learning Model to the Teaching of "Computer Application Fundamentals" Course and the Comparison Test

4.1   The Process of Applying the Independent Cooperative Learning Model Based on ADDIE Model to the Teaching of "Computer Application Foundation" Course

The teaching method based on the ADDIE model of independent cooperative learning is applied to the chapter of Computer Composition Principles in the secondary vocational "Computer Application Fundamentals" course as an example.

1) Develop students' independent inquiry skills: Self-directed learning ability has something different from cooperative learning inquiry ability, and its formation requires a relatively long cycle; therefore, to develop good independent inquiry ability in secondary vocational students, targeted training is needed from the beginning of school entry and long-term pedagogical interventions in teaching it as a major pathway [12].

   The application of the self-regulated cooperative learning mode based on ADDIE model to the teaching of "Computer Application Foundation" course is based on classroom teaching as the main training approach. At the beginning of this course, different self-regulated learning strategies are implemented according to the learning content of this course. First, according to the content of each lesson, students are assigned certain pre-course tasks, using task-driven methods to make students clear their interests and analyze their intrinsic motivation to learn, and to develop students' awareness of independent learning. Second, teachers should create certain activities within the classroom to stimulate students' independent learning atmosphere. For example, students compete

with each other for the best independent learning individual, the best performer in each group and so on. In addition, teachers should provide appropriate guidance and assistance in the process of independent learning to optimize students' independent learning strategies.

2) Develop students' cooperative inquiry skills: The development of cooperative learning ability of secondary vocational students should be carried out on the basis of a certain level of independent inquiry ability.

First of all, students should understand the importance and significance of cooperation, and transmit to them the necessity of cooperative inquiry skills for individual growth and collective development.

Secondly, teachers create conditions in the teaching process to make students better understand the importance of cooperative inquiry ability, infiltrate the key skills of how to cultivate cooperative inquiry ability into daily teaching, and fully show the importance of cooperative inquiry ability in the process of computer course practice, so that students can effectively match their ideological cooperative inquiry ability with their practical cooperative inquiry skills, and the cultivation of cooperative inquiry ability will be more effective.

Finally, setting up feedback on the results of cooperative inquiry in teaching, on the one hand, enables teachers to grasp whether this way of learning is effective and implementable, and on the other hand, enables students to better experience the sense of accomplishment brought by the results of cooperative inquiry, and to combine independent inquiry with cooperative inquiry in future learning to improve students' ability to acquire knowledge and skills.

The specific implementation process of the independent cooperative learning model based on the ADDIE model applied to learning computer hardware system components is shown in Table 1.

The above-mentioned independent cooperative learning model based on the ADDIE model is applied in the computer hardware system composition course in strict accordance with the five steps of the ADDIE model. Firstly, students' interest in learning is aroused through independent inquiry and analysis, and the content of this lesson is told to students. Then, the specific arrangement of the course designed by teachers is told to students. In the process of development and implementation, teachers explain the operation process of demonstration tasks in the classroom, complete the task of disassembling and assembling the computer mainframe through group cooperation, and select the best cooperation group in combination with the speed of disassembling and assembling the group and the correct rate of answering the components' names and functions. Finally, evaluate and summarize. In this implementation stage, the independent cooperative learning model based on the ADDIE model was applied to the "Computer Application Fundamentals" course. At first, students were rather restrained in group cooperation, relatively weak in their sense of cooperation, and preferred the teacher's indoctrination teaching. However, the competition among the groups effectively avoided the above problems. Overall, the application of the ADDIE model-based independent cooperative learning model can make learning more effective, increase the interactivity

Table 1. The implementation process of self-directed and cooperative learning mode applied to "Computer Application Foundation"

ADDIE	Events	Implementation Process
Analysis	attract one's attention	Teachers use multimedia equipment to play explanatory videos of computer hardware system components. Through playing, students are interested in exploring the names and functions of the components of the computer hardware system. The video ends with a display of the computer mainframe box cutaway images left for students to explore and analyze on their own before class to stimulate students' desire to explore their knowledge and increase their intrinsic motivation for independent learning.
	Inform the target	Let the students know that the main learning content and key content of this lesson is to complete the disassembly and assembly of the computer host through independent and cooperative inquiry, to be familiar with the components of the computer hardware system, to be able to match the components with their names and to understand the functions of each component.
Design	Stimulate memory	First of all, review the framework diagram of computer system composition learned in last class, so that students can recall the composition of computer system to some extent. Then, the teacher uses PPT to play the preview homework for the students, the profile picture of the computer mainframe, and the main parts are marked with numbers. Ask the students to introduce which parts of the computer hardware system are marked with numbers in the pictures and what their functions are.
Development and Implementation	Present stimulation	Show the computer chassis components in the prepared picture to students, and introduce the name and position of each component in the picture and its role in the computer.

(*continued*)

Table 1. (*continued*)

ADDIE	Events	Implementation Process
	Demonstration and guidance	Take the prepared main computer case to the podium, prepare all the tools for opening the main computer case, demonstrate the dismantling of the main computer case to students on the spot, and dictate the unpacking steps. During the demonstration, students are required to observe carefully, think carefully and make relevant records, so as to fully mobilize students' autonomous learning initiative. In this process, every time the teacher dismantles a component, the teacher asks the students the name and function of the component, and the group cooperates to answer the question, and the group with the high correct answer rate gives praise.
	Intra-group cooperation, inter-group competition	Students work in groups to disassemble the computer chassis, refer to the contents of each student's independent records during the lecture, the implementation of the division of labor and cooperation, to maximize the mobilization of each student's initiative to improve the students' practical hands-on ability. Each group to choose a team leader is responsible for coordinating the division of labor, after the completion of the selection of groups, the teacher set aside a few minutes in advance for each group to work together to develop a work execution plan, clear steps and methods to complete the task of disassembling the computer chassis. In order to prevent students from being "lazy" when working in groups, students are required to independently complete their individual operation ideas in the task schedule before working in groups, after which group members communicate and coordinate to ensure that each student is proficient in the task of disassembling and assembling the computer's mainframe chassis and is able to know what the functions of each What is the function of the components.

Table 1. (*continued*)

ADDIE	Events	Implementation Process
	Assigning homework	The assignments should be consistent with what we have learned in this lesson. Complete the exercises after class in this lesson, consolidate what we learned in class today, review the steps of disassembling and assembling the mainframe case today and retell them orally. Students who have the ability can disassemble and assemble their notebooks to try and find out the differences between portable notebooks and the mainframe case structure of desktop computers dismantled in our class.
Evaluation	Homework feedback	The teacher will take the students through the computer hardware system components again and do a process and summative assessment before the next class session.
	Promote retention and migration	After studying the contents of this section, students have already known the names and functions of each component of the computer hardware system, laying a foundation for the future study of computer network courses.

of the classroom, and not only cultivate students' autonomy but also enhance their sense of cooperation.

4.2 Implementation of Teaching Methods to Produce Results and Comparison Tests

Applying the independent cooperative learning mode based on ADDIE model to the education and teaching of this course has a good effect. Students in the class can independently disassemble and assemble the computer mainframe, and master the composition and functions of the computer hardware system skillfully.

Two experimental groups were established in the comparison test section. The first experimental group was the students of Computer Network Technology class I who used the independent cooperative learning model based on the ADDIE model, and the second experimental group was the students of Computer Network Technology class II who used the traditional teaching method. The students in both classes were of the same level, both majored in computer applications, and offered the same hours of "Computer Network Fundamentals" course, with the same teaching environment and teaching equipment. Fifteen students were randomly selected from each of the two classes to conduct a comparison test on the teaching effect. In the case of learning the components of computer hardware systems using the two teaching methods separately, 15 students selected from each class were tested for learning such as dismantling and installing the computer, and the results shown in Table 2 were obtained.

Table 2. Teaching effect comparison test results table

Classes	Students	Dismantling speed	Installing speed	The correct answer rate of components and functions
Class I	Student1	5′43″	10′34″	92.0%
	Student2	5′23″	11′45″	90.8%
	Student3	4′55″	11′50″	94.3%
	Student4	6′13″	12′38″	94.7%
	Student5	5′25″	10′45″	96.0%
	Student6	6′46″	12′34″	92.2%
	Student7	5′18″	13′56″	93.5%
	Student8	4′44″	11′46″	94.7%
	Student9	5′36″	10′55″	97.2%
	Student10	7′03″	13′04″	91.8%
	Student11	7′43″	13′54″	92.6%
	Student12	6′21″	12′44″	92.4%
	Student13	5′47″	11′58″	95.5%
	Student14	6′03″	11′24″	94.6%
	Student15	5′50″	13′26″	93.3%
Class II	Student1	7′54″	14′44″	82.1%
	Student2	8′55″	15′04″	82.9%
	Student3	8′34″	16′50″	81.7%
	Student4	7′23″	14′23″	82.4%
	Student5	9′34″	17′58″	83.8%
	Student6	9′46″	18′45″	86.3%
	Student7	7′45″	15′04″	80.6%
	Student8	8′57″	14′09″	79.9%
	Student9	6′42″	13′47″	87.5%
	Student10	7′52″	16′55″	83.5%
	Student11	8′34″	14′24″	90.8%
	Student12	7′22″	12′03″	87.0%
	Student13	7′25″	13′34″	87.2%
	Student14	6′21″	13′14″	88.1%
	Student15	8′03″	15′20″	75.3%

From the results in the table, we can see that the teaching results produced by the two teaching methods are very different.

Dismantling speed comparison

	class I	class II
Average	3.55	4.84
Cases	15.00	15.00
Standard Deviation	.48	.59
SEM	.12	.15
Variance	.23	.35
Min	2.84	3.81
Max	4.63	5.86

Fig. 2. Dismantling speed comparison

By using the SPSS software, the experimental data are analyzed by Avg and Variance and so on. The results are as follows.

As shown in Fig. 2, the average dismantling speed of computer network technology class I adopting the independent cooperative learning mode based on ADDIE model is faster than that of computer network technology class II adopting the traditional teaching method. The average standard error and standard deviation of class I are less than those of class II, and the variance of class I is smaller than that of class II, which indicates that the students of class I adopting the independent cooperative learning mode based on ADDIE model have a more stable knowledge level than class II.

As shown in Fig. 3, the average loading speed of Computer Network Technology class I with the ADDIE model-based self-directed cooperative learning model was about 2 min faster than that of Computer Network Technology class II with the traditional teaching method. The variance of the loading speed of the class I is 0.42, and the variance of the

Installation speed comparison

	class I	class II
Average	7.33	9.05
Cases	15.00	15.00
Standard Deviation	.65	1.10
SEM	.17	.28
Variance	.42	1.20
Min	6.34	7.23
Max	8.36	11.25

Fig. 3. Installation speed comparison

The correct answer rate of components and functions

	class I	class II
Average	93.71	83.93
Cases	15.00	15.00
Standard Deviation	1.78	3.94
SEM	.46	1.02
Variance	3.16	15.50
Min	90.80	75.30
Max	97.20	90.80

Fig. 4. The correct answer rate of components and functions

loading speed of the class II is 1.2. Thus, it can be seen that the independent cooperative learning mode based on the ADDIE model is more conducive to narrowing the gap between students' mastery of knowledge, while the traditional teaching method makes a large gap between students, which is not conducive to the development of students in all aspects.

As shown in Fig. 4, the average part and function answer correct rate of class I was 93.71%, and the correct rate of class II was 83.93%. The average part and function answer correct rate of ADDIE for class I was 3.16, and that for class II was 15.5, and the difference between them was large. This shows that the teaching effect of using the independent cooperative learning model based on ADDIE model is good.

After the experimental comparison, a questionnaire survey was used to collect the feedback of students from Class I of Computer Network Technology on the teaching effect of applying the independent cooperative learning mode based on ADDIE model in the course of Basic Computer Application. 84.7% of the students thought that the learning effect was good, 10.2% of the students thought that the learning effect was good, and only 5.1% of the students thought that the learning effect was poor.

In summary, the results of the SPSS software analysis show that the application of the ADDIE model-based independent cooperative learning model in the "Computer Application Fundamentals" course can improve the efficiency of student learning and improve the teaching quality.

5   Conclusions

In recent years, with the continuous reform and innovation of basic education, many innovative teaching methods have emerged in the secondary vocational "Computer Application Fundamentals" course. For example, task-driven teaching, independent inquiry teaching, hybrid teaching and so on. This paper proposes to apply the teaching mode of independent cooperative learning based on ADDIE model to the teaching of "Computer Application Fundamentals" course, which is effective, not only can improve students'

course performance, but also can enhance students' independent learning ability and cooperative spirit, and students enhance their self-confidence and communication and cooperation ability in this teaching context, which will have a subtle influence on students' employment after graduation. In the future, more and more secondary vocational computer teachers will devote themselves to the classroom teaching reform of computer education, and I hope that the teaching reform methods I proposed can be practically applied to more secondary classrooms to further supplement and optimize the teaching methods.

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