

# Application of Peer Assisted Learning in Secondary Vocational Programming Course

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**Abstract.** The epidemic has subsided, and the focus of education has returned to offline teaching. Combining the respective advantages of online and offline teaching, it is always an important task of education to introduce innovative teaching methods and solve the problems in teaching.<sup>[6]</sup> In current teaching, there are problems such as students' low enthusiasm, low participation and lack of self-confidence. In this paper, we integrate peer assisted learning into the teaching of computer science to explore whether this method can help solve the above problems.

**Keywords:** Offline teaching, Innovative teaching method, Peer assisted learning, Computer science

## 1 Introduction

The PAL teaching method is used in many countries around the world with the goal of promoting the progress of students in the learning process. Practice shows that this has a positive impact on students' learning. In addition, the best results are achieved when communicating with peers of the same age or subject area. Peer mutual aid was proposed by Joyce and Shower in the 1970s. Introduced by the University of Kansas and Missouri in 1973, PAL is defined as one of PAL's academic support programs, designed to prepare undergraduate graduates and develop their ability to lead other students into the program. One study discussed how the implementation of PAL in computer science courses affected student learning and satisfaction. The study found that in addition to other non-PAL practices, PAL can provide a rich experience for students by combining lecturing and teacher-led presentations with PAL activities to guide students to investigate and learn with their peers. In the 1990s, PAL was modified to accommodate English language education. This proved to be very helpful for the course, and participants scored higher and their memory improved to adapt to college life.<sup>[1]</sup>

## 2 Related literature

From the perspective of literature, there are more foreign researches on peer assisted learning, most of which are in medical education, medical fringe disciplines and higher education, in addition to psychology, computer software and computer applications, foreign languages, clinical medicine and other fields. Most of these literatures are of research type and written in

English. There are relatively few researches in China. The main topics are peer assistance, oral output, mobile assisted language learning, research and application, and learners. The main research fields are educational theory and management, computer software and computer applications, foreign languages, higher education, clinical medicine, physical education, secondary education, primary education. In general, there are few studies on the application of peer assisted learning to programming courses. In combination with previous studies, this method can be integrated into teaching activities and is multidisciplinary.

### **3 Environment and participants**

This study is carried out in the course of web design of computer application major in a secondary vocational school in Jinan City, which is a required course of computer application major. Prerequisites for this course are minimal and no previous programming experience is required. The study involved 40 participants, including 20 students and 20 supervisors, 40 of whom agreed to participate in the study. Participants were first-year students majoring in computer applications, and tutors were selected from second-year students in the same major. They are all second-year students who have successfully completed and mastered the web design course, and their comprehensive academic performance is good. Research costs are not high, tutors are volunteers, and teachers lead students for a semester.

### **4 Research method**

The study was conducted in two classes taught by the same teacher, namely the normal class and the experimental class. At the end of the semester, SPSS software was used to analyze the scores of students in the two classes to test the PAL teaching effect. A questionnaire survey was conducted on students and tutors in the experimental class, and SPSS software was used to analyze the reliability and validity of the questionnaire. Semi-structured interviews were conducted with teachers and tutors. Finally, swot analysis method is used to analyze the results and gain experience from it.<sup>[7]</sup>

### **5 Introduction to related terms**

PAL:Peer assisted learning, a teaching method to improve students' comprehensive skills with the help of peers. In the class, students of the same grade or senior students act as mentors, giving one-to-one guidance to students. Under the guidance of the mentors, it is a process of perfecting knowledge and improving their own abilities.<sup>[8]</sup>

Semi-structured interview: A type of research that provides insight into the interviewee's perspectives, experiences, and thoughts. Compared with the pre-set question method, semi-structured interview gives the interviewees more choices on some topics and enables them to better express their views and details. Through the answers to the interviewees, researchers can further explore some of the issues, and through the follow-up questions to help researchers understand, explain and solve the problem.

SWOT data analysis: A common strategic management tool used to assess the strengths, weaknesses, opportunities and threats of an organization, project or individual. This analysis provides a comprehensive perspective for making strategic decisions, helping organizations or individuals identify their strengths and opportunities, and develop countermeasures based on weaknesses and threats.

## 6 Experimental method

PAL teaching: In this study, PAL consists of a pair of students, with a small tutor supervising one student, who collaborates with each other in class. In the first half of the course, the teacher explains the knowledge and demonstrates it. After the demonstration, the task is released. In the second half of the course, the two students will solve problems together, and students can ask the small tutor to solve the problems, and the tasks will be completed in class time. Teachers will be on hand to answer any questions or provide additional information to groups as needed, and check on groups of students in class to make sure no student is afraid to ask for help while struggling. Students will be able to learn at their own pace, with no bonuses or incentives for completing tasks ahead of time, and their work will be submitted to the teacher before the end of the course, and will be graded according to the work as a regular grade.<sup>[3]</sup>

Non-PAL teaching: As in traditional web design courses, teachers usually use the following teaching strategies: lecture, demonstration, and personal practice. Lecturing means that the teacher explains the basic knowledge. Teachers will use computers and projectors as visual AIDS while explaining concepts and asking questions to facilitate student engagement. During the presentation, the instructor will write code and execute it in front of the class while explaining implementation details. In the individual practice section, students will write and implement the code themselves. As students practice programming, teachers will monitor their progress and provide individual assistance as needed. Finally, assign tasks after class to consolidate what you have learned.

## 7 Results and analysis

### 7.1 Questionnaire result

According to the data of questionnaire survey, the reliability and validity were tested by SPSS software. Klonbach Alpha coefficient  $>0.8$ , the reliability of the questionnaire is good. The KMO sample appropriateness measure was 0.754, the validity of the questionnaire was general, the variables were correlated and factor analysis could be performed. Significance  $<0.05$ , which means that the coefficient is significant, and the PAL teaching method designed in the experiment is effective. These are shown in Tables 1 and 2.

**Table 1.** Reliability statistics

Reliability statistics		
Klonbach Alpha	Klonbach Alpha based on standardized terms	Number of terms
.545	.808	12

**Table 2.** KMO and Bartlett tests

KMO and Bartlett tests		
KMO sample appropriateness measure		.754
Bartlett sphericity test	Approximate chi-square	341.443
	Degree of freedom	153
	significance	.003

## 7.2 Examination result

In order to explore whether peer-assisted learning can improve students' scores, we sorted out the final exam scores of two classes. Similarly, SPSS software was used to make T-test for samples. As shown in Table 3, sig coefficient is 0.767,  $>0.05$ . It can be concluded that compared with traditional teaching, PAL teaching has a significant change in student achievement, and the results show that PAL teaching is superior to traditional teaching methods.

**Table 3.** Paired sample test

Paired sample test									
Pairing difference									
		Mean value	Standard deviation	Standard Mean of error	Difference value 95% Confidence interval		t	Degree of freedom	Sig. (Double tail)
					floor	Upper limit			
pairing 1	Regular class achievement - Experimental class performance	-.45000	6.68443	1.49468	-3.57841	2.67841	-.301	19	.767

## 7.3 Interview results

All of the junior tutors were second year students who reported that they enjoyed the PAL experience, despite it being their first time. Of these, 80 percent said peer assisted learning methods were beneficial, 15 percent said they were beneficial to some extent, and only 5 percent said they were not. It was a new and rewarding experience for them. The tutors also suggested that all courses should try to apply this teaching method because it improves teaching efficiency. <sup>[10]</sup>After the interview, they put forward some opinions, which are as follows:

1. This teaching method can help students complete project assignments well
2. Students dare to ask questions and make comments in front of their peers
3. This method is applicable to all courses
4. play a certain role in supervision, improve teaching efficiency
5. Improved students' programming level
- 6.the teacher learned the sense of responsibility and confidence, to help themselves develop personality, gain more knowledge, make new friends

7. improve the skills of the small tutor to better explain and prepare the course, increase the employment advantage
8. Enhance students' communication opportunities and teamwork ability to overcome fear, tension and other psychology
9. Help students and teachers understand the curriculum more comprehensively

At the same time, the tutors also put forward some disadvantages based on the experience in the class, as follows:

1. Take a long time to prepare before each class<sup>[2]</sup>
2. Students' bad attitude and disrespectful behavior
3. Repeated questions

#### 7.4 SWOT analysis results

Finally, we conducted SWOT data analysis according to the interview results of the tutors and teachers, and obtained the following information, as shown in Table 4.

**Table 4.** SWOT analysis results

	<b>strengths</b>	<b>weaknesses</b>	<b>opportunities</b>	<b>threats</b>
<b>teacher</b>	Answering students' questions less, spending more time on other specialized work, receiving feedback to improve work	Less interaction between teachers and students, Students rely on tutors	Continuous improvement of coursework, More and more teachers are using PAL	Repeated course material, Students can get the answer without difficulty, Less access to students' ideas
<b>tutors</b>	Provide continuous feedback on the materials required for the course, Teachers understand the PAL curriculum comprehensively, Improved their comprehensive skills, Increase employment advantage	Repeated problem, Student attendance is low, Disrespectful behavior by students	Take more courses, Develop skills, pay to help students, Take part time	No incentive, Not exciting and sometimes boring

Through one semester of the PAL course, the junior tutors said that it was an effective and valuable teaching method, which had a positive impact on their knowledge and skills as well as those of their students.<sup>[5]</sup>PAL has many benefits, such as the ability of the junior tutor to receive feedback from the students at any time during the course, the ability of the teacher to understand the course more comprehensively and have more energy to devote to other work, and the ability to improve the junior tutor's skills and career opportunities. However, SWOT analysis found shortcomings such as students' reliance on small tutors, reduced communication between students and teachers, and disrespectful attitudes among students. It also found threats such as duplicate course materials, easily accessible answers, and the potential for small tutors to replace teachers.

In response to the above threats, the following suggestions are put forward:

First of all, plan the time of each teaching session in advance to ensure that there is enough time to prepare teaching materials. Encourage students to preview before class and reduce their preparation time by giving students relevant materials in advance, and encourage students to review and summarize after class to reduce the repetitive preparation work of teachers themselves. Secondly, strengthen the training of small tutors, and stipulate that small tutors can not replace students to complete homework, and the main task is to guide and guide. Finally, the leading power is still in the hands of the teacher, if the teacher is found in the class does not teach correctly, or there is a problem with the relationship between students, you can directly cancel the teacher's teaching qualification.

## **8 Conclusions**

The data of the questionnaire survey and the results of the examination results both show that the PAL teaching method is superior to the traditional teaching method, of course, it only represents this course. Through the questionnaire data and analysis results, it is concluded that peer assisted learning can improve students' learning enthusiasm and self-confidence, and promote the mutual communication among students.<sup>[4]</sup> Combined with some studies of educational sociology, it is found that there is cultural homogeneity among peers, and there are subcultures among peer groups, which can promote mutual learning and mutual communication among individuals.<sup>[9]</sup> Therefore, we believe that PAL method is suitable for the teaching of computer science and can play a positive role.<sup>[2]</sup>

## **9 Future work**

The study was a very small experiment with a small sample size. In future work, the experiment could be expanded to increase the sample size and control variables more precisely. In the future, it is also possible to observe the effect of PAL as a teaching method over a longer period of time, such as from the time students enter the school to the completion of this stage of study. At the same time, whether the application of PAL to the teaching of other subjects can bring positive effects also needs to be further explored.

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