

THE DEVELOPMENT OF LEARNING OUTCOMES THROUGH PROBLEM-BASED LEARNING ACTIVITIES FOR SECOND-YEAR VOCATIONAL COLLEGE STUDENTS*

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Abstract

This study aimed to: 1) compare the learning outcomes of second-year students in the Career Planning Course before and after participating in Traditional Learning Activity; 2) compare their learning outcomes before and after participating in Problem-Based Learning (PBL) Activity; and 3) compare the post-test learning outcomes between the PBL group and the Traditional Learning Activity group. An experimental study was conducted with 80 second-year Mechanical Manufacturing students at Guangxi Modern Vocational Technology College. The research instruments included Traditional Learning Activity lesson plans, PBL lesson plans, and a learning outcome test based on the Career Planning Course. Data were analyzed using mean, standard deviation, paired-samples t-tests, and an independent-samples t-test.

The results showed that: 1) students' learning outcomes after Traditional Learning Activity were significantly higher than before learning at the .01 level; 2)

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students' learning outcomes after PBL Activity were significantly higher than before learning at the .01 level; and 3) the PBL group achieved significantly higher post-test learning outcomes than the Traditional Learning Activity group at the .01 level. These findings suggest that PBL should be integrated into the Career Planning Course to strengthen students' understanding and practical application of employment-related knowledge.

Keywords: Problem-Based Learning, Learning Outcomes, Career Planning

Introduction

With the rapid development of China's economy and industrial transformation, higher vocational education has become increasingly important in cultivating skilled and application-oriented talents. The Chinese government has emphasized that vocational education should not only strengthen students' technical skills but also improve their comprehensive competencies and employability (The State Council of the People's Republic of China, 2019).

The Career Planning Course is an important course in vocational colleges. It aims to help students understand career opportunities, clarify career development goals, and develop job-seeking competencies. The course usually includes employment policy interpretation, career planning, résumé writing, interview preparation, psychological adjustment, and workplace adaptation (Kai, 2023, p. 61). For Mechanical Manufacturing students, these course topics are particularly relevant because they need to understand employment requirements, labor contracts, workplace responsibilities, and adaptation to production-oriented working environments. However, in many vocational colleges, this course is still mainly taught through teacher-centered instruction. Such teaching may limit students' classroom participation, practical application, and career decision-making ability (Zhang, X. H., 2023).

Traditional Learning Activity mainly focuses on knowledge transmission and standardized teaching procedures. Although this approach can help students acquire basic knowledge, it may not fully support learner autonomy and active engagement (Biggs & Tang, 2011). Zimmerman (2002) also pointed out that meaningful learning outcomes are closely related to students' active participation and self-regulated learning.

Problem-Based Learning Activity provides a possible solution to these problems. It is a student-centered instructional approach that encourages students to construct knowledge through authentic problem situations, group collaboration, and self-directed inquiry (De Graaff & Kolmos, 2003). Hmelo-Silver (2004) stated that Problem-Based Learning can enhance students' motivation, critical thinking, and problem-solving ability. Wood (2003) further emphasized that Problem-Based Learning helps students connect theoretical knowledge with real-world practice.

Although Problem-Based Learning has been widely discussed in educational research, its application in Career Planning Courses in higher vocational education remains relatively limited. Existing studies suggest that Problem-Based Learning can improve students' learning achievement and classroom participation in career-related courses (Guo, 2013). You (2016) also noted that Problem-Based Learning can strengthen students' practical ability and learning initiative.

Therefore, this study investigates the effectiveness of Problem-Based Learning Activity in improving the learning outcomes of second-year students in the Career Planning Course at Guangxi Modern Vocational Technology College. Second-year students were selected because this stage represents a transition from foundational study toward more career-oriented preparation, making it an appropriate period for developing career awareness and employment-related competencies. Specifically, this study compares students' learning outcomes

under Traditional Learning Activity and Problem-Based Learning Activity to determine which approach better supports vocational students' career development competence.

Objectives

1. To compare the learning outcomes of second-year students in the Career Planning Course before and after participating in Traditional Learning Activity.
2. To compare the learning outcomes of second-year students in the Career Planning Course before and after participating in Problem-Based Learning (PBL) Activity.
3. To compare the post-test learning outcomes of second-year students in the Career Planning Course between the Problem-Based Learning (PBL) Activity group and the Traditional Learning Activity group.

Literature Review

1. Problem-Based Learning Activities

Problem-Based Learning (PBL) is a student-centered instructional approach that uses authentic or simulated problems as the starting point for learning. Wood (2003) stated that PBL helps students identify learning goals, conduct self-directed study, and integrate knowledge through group discussion. Hmelo-Silver (2004) also defined PBL as a problem-centered method in which students solve complex problems without a single correct answer. The PBL process generally includes problem analysis, self-directed learning, group discussion, and reflection. De Graaff and Kolmos (2003) emphasized that PBL combines problem orientation, collaboration, and teacher facilitation. Wood (2003) further noted that PBL can promote deep learning, teamwork, communication, and transferable skills. Therefore, PBL is suitable for vocational

courses because it connects classroom knowledge with real professional situations. These processes also support students' self-regulation through goal setting, learning monitoring, and reflection.

2. Career Planning Course

The Career Planning Course aims to help students understand themselves, explore career opportunities, clarify career goals, and develop action plans. Kai (2023) indicated that the course usually includes employment policy interpretation, career cognition, résumé writing, interview skills, psychological adjustment, and workplace adaptation. Career development theory provides a theoretical basis for this course. Super (1990) viewed career choice as a lifelong developmental process. Savickas (2011) emphasized that career education should help individuals adapt to changing social and professional contexts. Therefore, the Career Planning Course should combine knowledge instruction with practical learning experiences. PBL is appropriate for this course because it allows students to apply career-related knowledge to practical employment situations.

3. Learning Outcomes

Learning outcomes refer to the knowledge, skills, and attitudes that students acquire after completing a learning process. Kennedy et al. (2007) emphasized that learning outcomes should be observable and measurable. In this study, learning outcomes refer to students' measurable academic achievement in the Career Planning Course. Learning outcomes are influenced by students' self-regulation and teaching quality. Zimmerman (2002) argued that self-regulated learners are better at goal setting, monitoring, strategy adjustment, and reflection. Kyriakides et al. (2013) found that classroom organization, practice opportunities, classroom climate, and assessment significantly affect student learning. Therefore, effective teaching should provide structured guidance and opportunities for active participation. Accordingly, PBL may improve learning

outcomes by strengthening students' self-regulation and providing opportunities for active participation and practical application.

Methodology

1. Research Design

This study employed an experimental research design with a pretest-posttest control group design. The experimental group received instruction through Problem-Based Learning Activity, while the control group received instruction through Traditional Learning Activity. Both groups completed a pre-test before the instructional intervention and a post-test after the intervention.

Because two intact classes were used, an independent-samples t-test was conducted to compare the pre-test scores of the two groups before the intervention. The results showed no statistically significant difference between the experimental group ($M = 44.63$, $S.D. = 7.04$) and the control group ($M = 45.31$, $S.D. = 7.83$), $t(78) = 0.408$, $p = .684$. Therefore, the two groups were considered comparable in their initial learning outcomes.

2. Population and Sample

The population of this study consisted of 240 second-year students from six classes enrolled in the Career Planning Course at Guangxi Modern Vocational Technology College in the 2025 academic year. The sample consisted of 80 second-year students majoring in Mechanical Manufacturing, selected through cluster random sampling. Two intact classes were selected, with 40 students assigned to the experimental group and 40 students assigned to the control group.

3. Research Instrument

The research instruments included Traditional Learning Activity lesson plans, Problem-Based Learning Activity lesson plans, and a learning outcome test. The instructional content was based on the Career Development and

Employment and Entrepreneurship Guidance textbook. The teaching topics mainly covered students' basic employment rights, understanding labor contracts, and the proper signing of labor contracts.

The learning outcome test was used as both the pre-test and post-test. It consisted of 40 multiple-choice questions, with each item worth 2.5 points and a total score of 100 points. The same test was administered before and after the intervention to ensure consistency and comparability.

The content validity of the test was evaluated by three experts using the Index of Item-Objective Congruence (IOC). All retained test items received an IOC value of 1.00, which was higher than the minimum acceptance criterion of 0.50. Therefore, the test items were considered consistent with the learning objectives. However, a separate reliability coefficient, such as KR-20, was not calculated in this study.

4. Data Collection

Data collection was conducted during the 2025 academic year over a six-week instructional period. Each class was conducted once a week for 90 minutes. Before the intervention, both the experimental group and the control group completed the learning outcome pre-test.

During the intervention, the experimental group learned through Problem-Based Learning Activity, while the control group learned through Traditional Learning Activity. After the six-week instructional period, both groups completed the same learning outcome test as the post-test. The collected scores were then organized and prepared for statistical analysis.

5. Data Analysis

The data were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to describe students' learning outcome scores. An independent-samples t-test was used to compare the pre-test scores of the

experimental and control groups to examine their equivalence before the intervention.

A paired-samples t-test was used to compare the pre-test and post-test scores within each group. An independent-samples t-test was also used to compare the post-test scores between the experimental group and the control group. Statistical significance was set at the .01 level.

Results

This section presents the findings obtained from the statistical analysis conducted to address the research objectives.

1. Learning Outcomes under the Traditional learning activity

Table 1 Comparison of Pre-test and Post-test Learning Outcomes under Traditional Learning Activity

Traditional learning activity	N	$\bar{X}$	S.D.	D	t-test	df	p
Pre-test	40	45.31	7.83	14.38	8.351	39	0.000**
Post-test	40	59.69	6.28				

* $p < 0.05$ ** $p < 0.01$

Table 1 shows that the mean score of students in the Traditional Learning Activity group increased from 45.31 (S.D. = 7.83) in the pre-test to 59.69 (S.D. = 6.28) in the post-test, with a mean difference of 14.38. The paired-samples t-test showed a statistically significant difference between the pre-test and post-test scores, $t(39) = 8.351$, $p < .001$.

2. Learning Outcomes after Problem-Based Learning Activity

Table 2 Comparison of Pre-test and Post-test Learning Outcomes under Problem-Based Learning Activity

PBL	N	$\bar{X}$	S.D.	D	t-test	df	p
Pre-test	40	44.63	7.04	28.50	15.766	39	0.000**
Post-test	40	73.13	7.48				

* p<0.05 ** p<0.01

Table 2 shows that the mean score of students in the Problem-Based Learning Activity group increased from 44.63 (S.D. = 7.04) in the pre-test to 73.13 (S.D. = 7.48) in the post-test, with a mean difference of 28.50. The paired-samples t-test showed a statistically significant difference between the pre-test and post-test scores, $t(39) = 15.766$, $p < .001$.

3. Comparison between Problem-Based Learning Activity and Traditional Learning Activity.

Table 3 Comparison of Post-test Learning Outcomes between the Two Group

Group	N	$\bar{X}$	S.D.	D	95% CI	t	df	p
PBL (Experimental)	40	73.13	7.48	13.44	[10.361, 16.514]	8.697	78	0.000 **
Traditional (Control)	40	59.69	6.28					

* p<0.05 ** p<0.01

The results showed that the post-test mean score of thTable 3 shows that the post-test mean score of the Problem-Based Learning Activity group was

73.13 (S.D. = 7.48), while the post-test mean score of the Traditional Learning Activity group was 59.69 (S.D. = 6.28). The mean difference between the two groups was 13.44.

The independent-samples t-test showed a statistically significant difference between the two groups, $t(78) = 8.697$, $p < .001$, 95% CI [10.361, 16.514]. Therefore, students who participated in Problem-Based Learning Activity achieved significantly higher post-test learning outcomes than students who participated in Traditional Learning Activity.

Discussion

This study examined the effectiveness of Problem-Based Learning Activity in the Career Planning Course.

Traditional Learning Activity significantly improved students' learning outcomes, indicating that structured instruction supports the acquisition of basic knowledge about employment rights and labor contracts (Kyriakides et al., 2013). However, its effect was smaller than that of PBL, possibly because it provides fewer opportunities for practical application.

Students in the PBL group showed greater improvement and higher post-test scores. Through problem analysis, collaboration, self-directed inquiry, and reflection, PBL helps students identify employment risks, interpret contract clauses, and make decisions in realistic situations (Hmelo-Silver, 2004). It therefore connects theoretical knowledge with practical employment problems, which is particularly relevant for Mechanical Manufacturing students preparing for production-oriented workplaces (Savery, 2006; Wood, 2003).

Overall, PBL was more effective than Traditional Learning Activity in developing students' practical application of employment-related knowledge.

Recommendation

Based on the findings of this study, the following recommendations are proposed.

First, teachers should integrate Problem-Based Learning Activity into the Career Planning Course by using practical tasks related to labor contracts, employment rights, résumé preparation, and interview situations.

Second, teachers should provide clear guidance during PBL activities and manage classroom time through structured stages. Problems and learning materials can be prepared before class, while classroom time can be divided into problem analysis, group discussion, presentation, and reflection. Teachers may also assign resource searching and part of the group preparation as pre-class tasks to reduce the time required during class.

Third, vocational colleges should support PBL implementation by providing teacher training, shared teaching resources, and sufficient classroom time. This can help teachers design practical and competence-oriented learning activities more efficiently.

Finally, future studies should include students from different majors and colleges and examine the long-term effects of PBL. Qualitative methods, such as semi-structured interviews, focus-group discussions, classroom observations, and student reflection journals, may also be used to explore changes in students' learning motivation and learning experiences.

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