A Study of Project-Based Learning on Student Achievement and Practical Skill in Film and Animation

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Abstract

The purpose of this study is to explore the effect of project-based learning on the academic performance and practical skills of students majoring in film and animation in higher vocational colleges. The research adopts a single group of pre-test and post test quasi experimental design, with 30 sophomores majoring in film and television animation in Quanzhou Light Industry Vocational College as the research object, and implements the project-based teaching intervention of animation short film creation for two weeks and eight class hours. The data were collected through academic achievement test, practical skills assessment scale and student satisfaction questionnaire, and analyzed by paired sample t-test, Cohen's D effect analysis and descriptive statistics. The results showed that: after the intervention of project-based teaching, the students' academic performance increased from 72.36 points to 81.52 points ($p<0.001$, $d=1.25$), and their practical skills increased from 68.75 points to 83.42 points ($p<0.001$, $d=1.73$); The average score of students' overall satisfaction is 4.23 (the full score is 5), and they have high recognition of project-based teaching. The research conclusion shows that project-based learning can significantly improve the theoretical academic performance and practical skills of students majoring in film and television animation, especially in problem-solving ability, whole process control and creative expression, which is suitable for the ability based teaching reform of Art Majors in higher vocational colleges.

Keywords : Project-based Learning, Film and Television Animation Major, Academic Performance, Practical Skills, Higher Vocational Education

1. Background and Significance of the Problem

Film and animation education in higher vocational colleges must prepare students to integrate artistic judgment, digital production technology, narrative design, teamwork, and project delivery. These capabilities are difficult to cultivate through a teaching model dominated by lectures, isolated software demonstrations, and final-product grading. When knowledge is taught separately from production tasks, students may remember concepts but remain unable to transfer them to the complete workflow of an animation project. The resulting gap between classroom learning and professional practice is especially important in film and animation, where a finished work depends on the coordinated completion of scripting, storyboarding, modeling, animation, rendering, sound, editing, and presentation.

Project-based learning offers a relevant response because it organizes learning around an authentic task that requires sustained inquiry, collaboration, decision making, production, feedback, and public presentation. In a PBL environment, students do not merely receive information; they use knowledge to solve practical problems and create a concrete product. This approach is consistent with

constructivist learning, which views knowledge as actively constructed, and with situated learning, which emphasizes participation in meaningful contexts (Krajcik & Blumenfeld, 2021; Lave & Wenger, 2019). It also draws on cooperative learning because students negotiate roles, coordinate interdependent tasks, and take collective responsibility for an outcome (Johnson & Johnson, 2020).

The potential value of PBL is particularly strong in vocational education. Vocational curricula emphasize occupational competence, the integration of theory and practice, and alignment with workplace processes (Huang, 2020; Jiang, 2022). A short-film project can therefore function as both a learning structure and a simulated professional workflow. Students must interpret a production brief, transform it into a feasible plan, select tools, solve technical problems, revise their work after feedback, and explain the final product. Previous literature has associated PBL with deeper understanding, stronger problem solving, higher engagement, and improved practical performance (Barron, 2020; Blumenfeld et al., 2018; Savery, 2019). However, the effectiveness of PBL depends on the quality of project design, teacher scaffolding, available resources, and assessment procedures (Markham, 2021; Mergendoller & Thomas, 2020).

At Quanzhou Vocational College of Light Industry, the conventional separation of theoretical instruction and software practice created a need for a more integrated teaching model. The present study therefore introduced an eight-hour PBL intervention in a second-year film and animation course. Its significance lies in testing whether a compact, authentic project can improve both academic achievement and observable production skills, rather than treating knowledge and practice as unrelated outcomes. The study also examined satisfaction because students' perceptions of relevance, support, workload, and competence development affect their engagement with an instructional innovation.

2. Research Objectives

The study aimed to determine whether the implementation of project-based learning in a film and animation course improved students' academic achievement and practical skills and whether students regarded the instructional experience positively. Specifically, it compared pretest and posttest scores for academic achievement, compared pretest and posttest scores for practical skills, and described students' satisfaction with the course content, teaching methods, perceived learning outcomes, competence development, and instructional support.

3. Research Hypotheses

It was hypothesized that students' posttest academic achievement scores would be significantly higher than their pretest scores after participation in PBL; that their posttest practical skills scores would be significantly higher than their pretest scores; and that their overall satisfaction with PBL would be at a high level. The independent variable was the PBL intervention, while the dependent variables were academic achievement, practical skills, and satisfaction.

4. Scope of the Research

The content scope was the production of a short film or animation through the stages of project initiation, script development, storyboard and character design, basic animation production, compositing, revision, presentation, and reflection. The population consisted of 70 second-year film and animation students, and one intact class of 30 students was selected by cluster sampling. The study was

conducted at Quanzhou Vocational College of Light Industry during the 2025-2026 academic year. The intervention lasted two weeks and comprised four instructional plans totaling eight class hours. Students worked in teams of five or six. The conceptual relationship tested was that participation in an authentic, collaborative, teacher-scaffolded PBL process would lead to higher academic achievement, stronger practical skills, and high satisfaction.

5. Research Methodology

5.1 Research Design and Participants

A one-group pretest-posttest quasi-experimental design was used, represented as O1-X-O2. Before instruction, the 30 participants completed an academic achievement test and a practical skills task. They then participated in the PBL intervention and completed equivalent posttests. The absence of a control group means that the design can identify systematic within-group change but cannot eliminate every alternative explanation for that change. The participants included 18 male and 12 female students. Eleven had previous experience with team projects, whereas 19 reported no such experience. All 30 students completed the required measures, producing a valid response rate of 100%.

5.2 Project-Based Learning Intervention

The intervention was built around the creation of a one- to three-minute animated short film. In the first session, the teacher introduced the project brief, organized teams, clarified roles, and established milestones. Students then developed a concept and script, prepared storyboards and character designs, and began production. Subsequent activities included keyframe animation, scene construction, material application, compositing, sound, peer review, technical revision, final presentation, and reflective evaluation. The teacher acted as a facilitator by demonstrating essential techniques, monitoring progress, diagnosing problems, and providing feedback at critical points. Assessment combined participation, milestone products, the quality of the final work, peer feedback, and reflection.

6. Research Instruments

Four lesson-management plans structured the eight-hour intervention. Academic achievement was measured with a professional course test addressing basic theory, process cognition, and problem solving. Practical skills were measured through a portfolio and performance rubric covering technical operation, creative expression, process integrity, and team collaboration. Student satisfaction was measured with a five-point questionnaire containing closed and open-ended questions across course content, teaching methods, learning outcomes and competence improvement, and teaching support and resources. The instruments were developed from course objectives, professional standards, and the teaching syllabus to support content validity. The original study specified Cronbach's alpha greater than .70 as the criterion for acceptable internal consistency; a future publication should report the obtained coefficients and expert-review evidence in full.

7. Data Collection

Data collection followed three stages. During preparation, the project plans and instruments were developed, the sample was selected, and the implementation schedule was established. During the first class period, students completed the academic and practical pretests under supervised conditions. The intervention was then delivered during regular class time over two weeks. Teachers recorded milestone

performance and provided structured feedback without changing the scoring standards. At the end of the intervention, students completed the academic achievement posttest, the practical skills posttest, and the satisfaction questionnaire. Open-ended responses were also collected to identify the most valued features and the principal difficulties. Scores were checked for completeness and entered into a spreadsheet for analysis.

8. Data Analysis

Means, standard deviations, minimum values, and maximum values were used to describe the distribution of academic achievement and practical skills. Paired-samples t tests compared pretest and posttest means at an alpha level of .05. Cohen's d was calculated to estimate practical significance, with values around .20, .50, and .80 interpreted as small, medium, and large effects, respectively. Satisfaction data were summarized using means and percentages. Responses to the open-ended questions were grouped by recurring topic and reported as frequency counts. Because the study used the same group before and after the intervention, the analysis focused on within-participant change.

9. Research Summary

9.1Academic Achievement and Practical Skills

Students' academic achievement improved substantially after PBL. The mean increased by 9.16 points, from 72.36 to 81.52, and the standard deviation decreased from 8.42 to 6.78. The paired-samples test was statistically significant, $t(29) = -6.832$, $p < .001$, and the effect was large, $d = 1.25$. Practical skills increased by 14.67 points, from 68.75 to 83.42. This difference was also statistically significant, $t(29) = -9.457$, $p < .001$, with a large effect, $d = 1.73$. The two achievement hypotheses were therefore supported.

Table 1. Pretest-Posttest Results for the Main Outcomes

Outcome	Pretest M	Pretest SD	Posttest M	Posttest SD	Mean gain	t(29)	p/d
Academic achievement	72.36	8.42	81.52	6.78	9.16	-6.832	< .001/1.25
Practical skills	68.75	9.26	83.42	7.13	14.67	-9.457	< .001/1.73

Analysis by dimension showed that the strongest academic gain occurred in problem solving, which rose from 69.38 to 80.70, a 16.32% increase. Process cognition increased by 15.37%, while basic theory increased by 9.06%. For practical skills, process integrity showed the largest relative increase (26.09%), followed by creative expression (22.80%), team collaboration (22.14%), and technical operation (19.45%). Thus, PBL produced the most pronounced gains in the outcomes most closely connected to completing and coordinating an authentic production process.

Table 2. Changes in Academic Achievement and Practical Skill Dimensions

Domain and dimension	Pretest M	Posttest M	Gain	Increase (%)
Academic: Basic theory	75.62	82.47	6.85	9.06
Academic: Process cognition	70.15	80.93	10.78	15.37
Academic: Problem solving	69.38	80.70	11.32	16.32
Skill: Technical operation	71.25	85.11	13.86	19.45
Skill: Creative expression	66.83	82.06	15.23	22.80
Skill: Process integrity	64.32	81.10	16.78	26.09
Skill: Team collaboration	66.50	81.22	14.72	22.14

9.2 Student Satisfaction

Overall satisfaction was high, with a mean of 4.23 out of 5, supporting the third hypothesis. Learning outcomes and competence improvement received the highest domain mean (4.35), while course content received the lowest, though still positive, mean (4.08). In the course-content domain, 73.33% of students selected satisfied or very satisfied; the corresponding proportions were 80.00% for teaching methods, 86.67% for learning outcomes, and 76.67% for teaching support and resources. The highest-rated item was the perceived improvement of professional animation skills (M = 4.42).

Open-ended comments reinforced these quantitative findings. Students most frequently valued the sense of achievement generated by real project practice (12 mentions), communication and mutual assistance within teams (8 mentions), targeted teacher feedback (7 mentions), and improvement in the ability to apply skills (6 mentions). The principal concerns were the tight schedule (9 mentions), imperfect alignment between reference materials and project requirements (5 mentions), unequal contribution or responsibility avoidance in some teams (4 mentions), and an insufficiently smooth connection between theoretical explanation and practical operation (3 mentions).

10. Discussion

The large improvement in academic achievement suggests that PBL helped students connect conceptual knowledge with the decisions required during production. The greatest gain occurred in problem solving, whereas basic theory showed the smallest relative increase. This pattern is theoretically coherent: authentic projects repeatedly require students to diagnose errors, select strategies, and justify technical or artistic choices, while direct theoretical review occupies a smaller proportion of project time. The finding is consistent with the view that PBL supports deeper understanding by sustaining inquiry around a meaningful product (Barron, 2020; Blumenfeld et al., 2018). The lower posttest variability also suggests that team support and teacher scaffolding may have assisted students with weaker initial preparation.

The effect on practical skills was even larger than the effect on academic achievement. Process integrity improved most because the project exposed students to the complete production sequence rather than isolated exercises. Film and animation work is inherently interdependent: an early decision about script, design, timing, or asset preparation affects later stages of animation and compositing.

By moving through the full workflow, students learned not only how to operate software but also when and why particular procedures were needed. This interpretation agrees with situated and experiential perspectives, in which competence develops through participation in meaningful activity (Lave & Wenger, 2019; Savery, 2019). It also supports Chapman's (2021) argument that project structures are particularly appropriate for media production education.

The gains in creative expression and team collaboration further illustrate the multidimensional value of PBL. Open-ended production problems permit more than one acceptable solution and therefore encourage experimentation, critique, and revision. At the same time, assigned roles and shared milestones create positive interdependence. Students must communicate specifications, negotiate changes, and resolve conflicts to protect the quality and schedule of the final product, which reflects the mechanisms described in cooperative learning theory (Johnson & Johnson, 2020). These outcomes are occupationally important because film and animation production depends on coordinated creative and technical labor rather than individual software proficiency alone.

High satisfaction appears to have resulted from authenticity, visible progress, and a tangible final product. Students could see the relationship between classroom activity and professional practice and could attribute improvement to tasks they had completed. Nevertheless, the feedback also identifies conditions that may weaken PBL. An eight-hour schedule is short for a complex animation project, and rushed production can restrict reflection or encourage superficial completion. Unequal team contribution can also inflate or obscure individual learning if assessment relies heavily on the group product. Effective PBL therefore requires clear milestones, role rotation, progress evidence, individual reflection, and a balanced evaluation of group output and personal contribution (Markham, 2021; Mergendoller & Thomas, 2020).

The findings should be interpreted cautiously. The study involved one intact class at one institution, used no control group, and lasted only two weeks. Testing effects, maturation, teacher influence, or other concurrent experiences cannot be fully separated from the intervention. In addition, the thesis described the intended validation and reliability procedures but did not report all obtained coefficients or expert-review indices. The results provide promising evidence of within-group improvement, but stronger causal claims require a controlled design, fuller psychometric reporting, and replication across cohorts and institutions.

A compact PBL intervention produced statistically significant and educationally large improvements in academic achievement and practical skills among second-year film and animation students. The most pronounced gains occurred in problem solving and process integrity, demonstrating that an authentic production project can integrate conceptual learning with the coordinated application of professional skills. Students also reported high satisfaction, especially with perceived competence development. PBL is therefore a promising instructional model for vocational film and animation education when project scope, scaffolding, resources, and assessment are carefully designed.

11. Suggestions/Recommendations

In instructional design practice, film and animation programs should organize selected course units around real-world projects and fully replicate the complete production workflow. Project tasks should adopt a modular design, incorporating clear task briefs, deliverables, milestone checkpoints, technical demonstration sessions, and a structured review and feedback mechanism. Resource package

configurations must be closely aligned with task requirements, and instructors should provide differentiated support without substituting for students' own decision-making. Team assessment should integrate both the quality of collective outputs and individual process-based evidence, including role logs, version iteration records, peer evaluations, defense presentations, and reflection reports. Collaboration with industry practitioners can further enhance project authenticity and benchmarking standards.

Proposed directions for future research are advanced in four dimensions. First, controlled experiments with a control group delivered via conventional teaching shall be designed to quantitatively verify the value-added pedagogical effects of project-based learning relative to traditional classroom instruction. Second, long-term longitudinal follow-up studies should be conducted to systematically investigate the sustained impacts of PBL on students' graduation internship performance and the development of their professional employability. Third, assessment scales can be optimized and refined grounded in practical teaching data and theoretical rationales to improve the standardized evaluation framework. Fourth, an actionable implementation framework integrating PBL with AI-assisted instructional tools may be constructed to explore innovative paradigms for animation pedagogy empowered by intelligent technologies.

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