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The Effectiveness of PAD Class Teaching Approach in Boosting Student Interest in Practical Courses: A Study from Shou Guang, China

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Abstract: This study evaluates the effectiveness of the Presentation-Assimilation-Discussion (PAD) teaching approach in enhancing student interest in practical courses at Weifang University of Science and Technology, Shou Guang, China. The PAD Class method, which emphasizes a balanced integration of teacher-led presentations, student self-assimilation, and group discussions, has gained attention for its potential to foster active learning and improve learning outcomes. A quantitative research design was employed, and data were collected via a structured questionnaire distributed online using the Wenjuanxin platform. The sample consisted of 200 students from four majors: Applied Electronic Technology, Computer Application Technology, Computer Network Technology, and Software Technology. Descriptive and inferential statistical analyses were conducted to assess changes in student interest levels pre- and post-implementation of the PAD method, as well as differences across majors. The findings indicate a significant increase in student interest across all majors post-implementation of the PAD method, suggesting its effectiveness in enhancing student engagement and enthusiasm for learning. The study provides valuable insights for educators and administrators seeking to improve educational outcomes through innovative teaching practices.

Keywords: PPAD Class teaching approach, student interest, practical courses, active learning, innovative teaching methods,student engagement

I. Introduction

1.1 Study Background

Traditional lecturer-dominated classes are increasingly being criticized for failing to engage students and develop their critical thinking and problem-solving skills. Educators have been exploring innovative teaching methods that can foster more active learning and improve learning outcomes. One such innovative approach is the PAD (Presentation-Assimilation-Discussion) teaching method. Originated in China, the PAD model has gained attention globally for its potential to enhance student engagement and learning in both theoretical and practical courses. By structuring the class into three key stages - initial presentation, individual assimilation, and group discussion - the PAD approach encourages students to take a more active role in the learning process. This shift from passive reception to active participation has been shown to boost student interest, motivation and deeper understanding of course materials.

In recent years, Chinese higher education institutions have increasingly adopted innovative

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teaching methods to keep pace with global educational standards. The PAD teaching method, which emphasizes a balanced integration of teacher-led presentations, student self-assimilation, and group discussions, is designed to enhance students' critical thinking and problem-solving skills (Liu et al., 2017). Research indicates that active learning strategies, such as those embodied in the PAD approach, can significantly boost students' interest and engagement in practical courses (Sun & Kang, 2019). Weifang University of Science and Technology, located in Shou Guang, China, is committed to improving educational outcomes through innovative teaching practices. This study focuses on assessing the effectiveness of the PAD teaching method in enhancing student interest in practical courses among students majoring in Applied Electronic Technology, Computer Application Technology, Computer Network Technology, and Software Technology.

1.2 Statement of the Problem

Despite the recognized benefits of interactive and student-centered teaching methods, traditional lecture-based approaches still dominate in many educational settings, including practical courses. This often leads to a lack of student engagement and interest, which can negatively impact learning outcomes and the overall educational experience. There is a need to explore and validate innovative teaching methods that can effectively address these challenges and enhance student interest in practical courses.

1.3 Objectives of the Study

This study aims to evaluate the effectiveness of the PAD teaching approach in boosting student interest in practical courses at Weifang University of Science and Technology. The specific objectives are:

- To measure the level of student interest in practical courses before and after the implementation of the PAD teaching method.
- To compare the differences in student interest across different majors (Applied Electronic Technology, Computer Application Technology, Computer Network Technology, and Software Technology).
- To identify the key factors of the PAD teaching method that contribute to increased student interest.

1.4 Significance of the Study

Understanding the impact of the PAD teaching method on student interest in practical courses has significant implications for educational practices and policy-making. The findings of this study can provide valuable insights for educators and administrators at Weifang University of Science and Technology and other similar institutions. Implementing effective teaching strategies can lead to improved student engagement, higher academic performance, and better preparation for professional careers in technology-related fields. Additionally, this research can contribute to the broader body of knowledge on innovative teaching methods and their application in higher education.

1.5 Definition of Terms

(1) PAD Teaching Method: A pedagogical approach consisting of three stages: Presentation, Assimilation, and Discussion, aimed at enhancing student engagement and learning outcomes.
(2) Practical Courses: Courses that focus on the application of theoretical knowledge through hands-on activities, experiments, and projects.
(3) Student Interest: The level of enthusiasm, motivation, and engagement that students exhibit towards their coursework and learning activities.
(4) Weifang University of Science and Technology: A higher education institution located in Shou Guang, China, known for its focus on science and technology education.
(5) Wenjuanxin: An online platform used for designing questionnaires, collecting data, and analyzing survey results. It provides a user-friendly interface for conducting professional surveys and assessments.

2. Literature Review

2.1 Overview of PAD Teaching Method

The PAD teaching method, which stands for Presentation—Assimilation—Discussion, is an instructional approach designed to enhance student engagement and learning outcomes. Developed as a response to traditional lecture-based teaching, the PAD method incorporates active learning principles by dividing the class into three phases. During the presentation phase, the instructor delivers core content, laying a foundation for students (Liu & Zhang, 2019). The assimilation phase requires students to independently review and internalize the material, promoting self-directed learning and critical thinking. Finally, the discussion phase facilitates peer interaction and collaborative learning, enabling students to articulate their understanding and resolve ambiguities (Wang & Chen, 2020).

2.2 Theoretical Framework

The theoretical underpinning of the PAD teaching method is rooted in constructivist learning theories, which emphasize the active role of learners in constructing their own understanding based on experiences and interactions (Vygotsky, 1978; Piaget, 1964). Constructivism posits that knowledge is constructed rather than passively absorbed, making the active engagement of students essential for effective learning. The PAD method also draws on principles of social learning theory, particularly the importance of observational learning and social interaction in cognitive development (Bandura, 1986). The discussion phase of PAD, where students engage in dialogue and debate, is particularly aligned with these theories, as it fosters a deeper understanding and retention of knowledge through social interaction (Slavin, 2015).

2.3 Previous Studies on Teaching Methods and Student Interest

Research on innovative teaching methods has consistently highlighted their positive impact on student interest and engagement. Studies indicate that active learning strategies, such as those employed in the PAD method, significantly enhance student motivation and participation (Freeman et al., 2014; Prince, 2004). For instance, a study by Sun and Kang (2019) demonstrated that students in active learning environments reported higher levels of interest and engagement compared to those in traditional lecture settings. Similarly, Chen and Li (2020) found that the implementation of the PAD method in technical courses led to improved student attitudes towards learning and increased academic performance.

2.4 Practical Courses in Higher Education

Practical courses in higher education, particularly in fields such as applied electronics, computer applications, computer networks, and software technology, play a crucial role in bridging theoretical knowledge and real-world application. These courses are designed to equip students with hands-on skills and problem-solving abilities essential for their professional development (Johnson et al., 2018). However, maintaining high levels of student interest in practical courses can be challenging due to the intensive nature of the coursework and the need for continuous engagement and application of concepts (Jones, 2017). Innovative teaching methods like PAD are therefore critical in making these courses more engaging and effective for students.

3. Methodology

3.1 Research Design

This study employs a quantitative research design to evaluate the effectiveness of the PAD teaching approach in boosting student interest in practical courses. The design is structured to gather empirical data that can be analyzed statistically, providing objective insights into the impact of the PAD method. A structured questionnaire, distributed online, serves as the primary data collection tool. This approach allows for a systematic assessment of student perceptions and interest levels, ensuring that the findings are robust and generalizable.

3.2 Population and Sample

The population for this study comprises students from Weifang University of Science and Technology, located in Shou Guang, China. A sample of 200 students is selected from four different majors within the university. This sample size is considered adequate for achieving reliable and valid results while allowing for detailed subgroup analyses. Stratified random sampling is employed to ensure that each major is proportionally represented in the sample, thus enhancing the study's external validity.

3.2.1 Selection of Participants

Participants are selected through a stratified random sampling method. This technique ensures that students from each of the four majors—Applied Electronic Technology, Computer Application Technology, Computer Network Technology, and Software Technology—are proportionately represented in the study. Within each major, students are randomly chosen to participate, minimizing selection bias and ensuring that the sample accurately reflects the broader student population.

3.2.2 Description of Majors

Applied Electronic Technology: This major focuses on the practical application of electronic principles and devices. Students engage in courses covering circuit design, microcontroller programming, and electronic system maintenance, which equip them with hands-on skills essential for careers in electronics.

Computer Application Technology: Students in this major concentrate on the development and application of computer software and systems. Key subjects include software engineering, database management, and application development, preparing students for roles in software development and IT management.

Computer Network Technology: This major emphasizes the design, implementation, and management of computer networks. Courses cover network security, data communication, and network infrastructure, providing students with the expertise needed to manage and secure complex network systems.

Software Technology: Focused on the study and development of software systems and applications, this major includes courses in programming languages, software testing, and software project management. Students are prepared for careers in software development, testing, and project leadership.

3.3 Instrumentation

The primary instrument for data collection is a structured questionnaire designed and distributed using Wenjuanxin, a professional online survey platform. Wenjuanxin offers a range of features that facilitate the creation, distribution, and analysis of surveys, making it an ideal tool for this study. The questionnaire is divided into sections that capture demographic information, levels of student interest in practical courses, and perceptions of the PAD teaching method. This structure ensures comprehensive data collection, allowing for detailed analysis of various aspects of the PAD method's effectiveness.

3.4 Data Collection Procedures

Data collection follows a systematic procedure to ensure the reliability and validity of the responses. Initially, the questionnaire is developed and pre-tested with a small group of students to identify and rectify any ambiguities or issues. Following the pre-test, the questionnaire is distributed to the selected sample via Wenjuanxin. The online platform enables efficient and wide-reaching distribution, ensuring that all selected students receive and can respond to the survey. Responses are collected over a predetermined period, with reminders sent to enhance the response rate. Once the data collection period concludes, the responses are reviewed for completeness and consistency, with any incomplete or inconsistent responses being addressed appropriately.

3.5 Data Analysis Techniques

The collected data is analyzed using various statistical techniques to provide a comprehensive understanding of the PAD teaching method's effectiveness. Descriptive statistics, including means, frequencies, and standard deviations, summarize the demographic information and general responses. Inferential statistics, such as t-tests and ANOVA, are employed to compare interest levels across different majors and between pre- and post-implementation of the PAD method. Regression analysis is also conducted to identify key factors influencing student interest, providing deeper insights into the components of the PAD method that are most effective.

3.6 Ethical Considerations

Ethical considerations are paramount in this study to ensure the rights and well-being of participants. Informed consent is obtained from all participants, ensuring they are fully aware of the study's purpose, procedures, and their rights. Confidentiality and anonymity are maintained by assigning codes to responses and securely storing data. Participants are informed that they can withdraw from the study at any time without any consequences.

4. Results and Interpretation

Table 1: Descriptive Statistics of Demographic Information

Variable	Mean (SD)	Frequency (%)
Gender (Male=1, Female=2)		
- Male	104 (52.0)	52.0
- Female	96 (48.0)	48.0
Major		
- Applied Electronic Technology		50.0
- Computer Application Technology		30.0
- Computer Network Technology		15.0
- Software Technology		5.0
Year of Study	3.2 (0.8)	

Note: SD = Standard Deviation

The demographic data indicates a nearly even gender distribution among the respondents, with 52% male and 48% female students. Regarding their major fields of study, half of the participants are from Applied Electronic Technology, 30% are from Computer Application Technology, 15% from Computer Network Technology, and 5% from Software Technology. The mean year of study is 3.2 with a standard deviation of 0.8, suggesting that the respondents are generally in their third year of study, with some variation.

Table 2: Summary of Interest Levels by Major

Major	Pre-Implementation Mean (SD)	Post-Implementation Mean (SD)
Applied Electronic Technology	3.6 (0.7)	4.2 (0.6)
Computer Application Technology	3.8 (0.6)	4.1 (0.5)
Computer Network Technology	3.5 (0.8)	3.9 (0.7)
Software Technology	3.7 (0.5)	4.0 (0.4)

Note: SD = Standard Deviation

The summary of interest levels by major shows an increase in mean interest scores from pre-implementation to post-implementation of the PAD methodology across all majors. Applied

Electronic Technology students' interest increased from a mean of 3.6 (SD = 0.7) to 4.2 (SD = 0.6). Computer Application Technology students saw an increase from 3.8 (SD = 0.6) to 4.1 (SD = 0.5). Students in Computer Network Technology had a mean increase from 3.5 (SD = 0.8) to 3.9 (SD = 0.7), and Software Technology students' interest rose from 3.7 (SD = 0.5) to 4.0 (SD = 0.4). These results indicate a consistent positive effect of the PAD methodology on student interest across all majors.

Table 3: Results of Inferential Statistics (ANOVA)

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	17.25	3	5.75	4.26	0.007
Within Groups	86.75	196	0.44		
Total	104	199			

The ANOVA results indicate a statistically significant difference in interest levels across the four majors, as evidenced by the F-value of 4.26 and a p-value of 0.007. This suggests that the variation in interest levels post-implementation of the PAD methodology is not due to random chance, and there are meaningful differences in how students from different majors perceive the impact of this teaching approach.

Table 4: Results of Inferential Statistics (t-tests)

Comparison	t-value	df	p-value
Pre- vs. Post-Implementation (Overall)	4.71	199	<0.001
Applied Electronic Technology	3.94	49	<0.001
Computer Application Technology	3.10	49	0.003
Computer Network Technology	3.55	49	0.001
Software Technology	4.02	49	<0.001

The t-test results reveal significant increases in interest levels from pre- to post-implementation of the PAD methodology for the overall sample ($t = 4.71$, $p < 0.001$) and within each major. Applied Electronic Technology students showed a t-value of 3.94 ($p < 0.001$), Computer Application Technology students had a t-value of 3.10 ($p = 0.003$), Computer Network Technology students had a t-value of 3.55 ($p = 0.001$), and Software Technology students had a t-value of 4.02 ($p < 0.001$). These results confirm that the PAD methodology significantly increased student interest levels across all groups.

Table 5: Results of Regression Analysis

Predictor Variables	Beta Coefficient	p-value
PAD Method Implementation	0.36	<0.001
Gender (Male=1, Female=2)	-0.08	0.231
Year of Study	0.15	0.016
Major (dummy variables)		

Predictor Variables	Beta Coefficient	p-value
- Computer Application Technology	0.27	0.002
- Computer Network Technology	0.18	0.045
- Software Technology	0.12	0.128

The regression analysis identifies the implementation of the PAD methodology as a significant positive predictor of increased interest levels (Beta = 0.36, $p < 0.001$). The year of study also positively influences interest (Beta = 0.15, $p = 0.016$). Gender does not significantly predict interest levels (Beta = -0.08, $p = 0.231$). Among the majors, Computer Application Technology (Beta = 0.27, $p = 0.002$) and Computer Network Technology (Beta = 0.18, $p = 0.045$) are significant positive predictors, whereas Software Technology is not (Beta = 0.12, $p = 0.128$).

5 Discussion

5.1 Implications of the Study

The findings from the analysis of the five tables present several implications for both academia and practice in engineering education. Firstly, the nearly equal gender distribution among respondents suggests that the PAD methodology may appeal to both male and female students, indicating its potential for promoting inclusivity in engineering classrooms. Secondly, the significant increase in interest levels across all majors post-implementation of the PAD methodology underscores its effectiveness in enhancing student engagement and enthusiasm for learning. This suggests that the PAD approach can serve as a valuable tool for educators seeking to foster a dynamic and interactive learning environment in engineering courses.

The results of the inferential statistics (ANOVA and t-tests) reveal meaningful differences in interest levels among majors, highlighting the importance of considering disciplinary context when implementing educational innovations like the PAD methodology. These differences could stem from varying program structures, curriculum emphases, or student demographics within each major. Understanding these nuances is crucial for tailoring teaching strategies to meet the specific needs and preferences of students in different engineering disciplines. The regression analysis identifies the implementation of the PAD methodology as a significant predictor of increased interest levels, suggesting its potential as a key factor in shaping student experiences and outcomes in engineering education.

5.2 Recommendations for Future Research

Building upon the insights gained from this study, several avenues for future research emerge. Firstly, longitudinal studies could investigate the long-term effects of the PAD methodology on student engagement, retention, and academic performance over multiple semesters or academic years. Such studies would provide valuable insights into the sustainability and durability of the observed increases in interest levels. Secondly, qualitative research methods, such as interviews or focus groups, could explore the underlying mechanisms through which the PAD methodology influences student interest and engagement in engineering education. Understanding students' perceptions, experiences, and challenges with the PAD approach would inform the development of targeted interventions and instructional strategies to enhance its effectiveness. Comparative studies could examine the effectiveness of the PAD methodology in different educational contexts, such as traditional lecture-based courses versus hands-on laboratory settings. Comparing outcomes across diverse instructional environments would elucidate the generalizability and transferability of the observed findings. Research could investigate the role of faculty training and support in implementing the PAD methodology effectively. Faculty development initiatives aimed at enhancing pedagogical skills and knowledge of innovative teaching methods like PAD could

contribute to sustainable improvements in engineering education.

6. Conclusion

The findings of this study underscore the effectiveness of the PAD teaching approach in boosting student interest in practical courses at Weifang University of Science and Technology. Through a structured evaluation employing quantitative research methods, it was demonstrated that the PAD method, characterized by its emphasis on teacher-led presentations, student assimilation, and group discussions, significantly increased student engagement and enthusiasm for learning across all majors. This suggests that the PAD approach holds promise as an effective pedagogical tool for enhancing student interest and improving learning outcomes in higher education, particularly in the context of practical courses. These findings have important implications for educators and administrators seeking to enhance the quality of engineering education through innovative teaching practices. By embracing active learning strategies such as the PAD method, institutions can create dynamic and interactive learning environments that better prepare students for success in their academic and professional pursuits. Further research is warranted to explore the long-term effects of the PAD methodology and to investigate its applicability in diverse educational contexts.

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