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The Impact of Industry-Education Integration on College Students' Motivation to Learn English under the TPACK Framework

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Abstract: This paper explores the impact of industry-education integration on students' motivation in college English courses under the TPACK (Technological Pedagogical Content Knowledge) framework using a comprehensive approach combining quantitative and qualitative methods. Quantitative data analysis indicates a significant positive correlation between the perception of industry-education integration and the level of student learning motivation. There is also a clear association between the perception scores of TPACK framework integration and learning motivation. Qualitative data analysis reveals students' positive experiences and recognition of the TPACK framework integration in practical application projects. The study concludes that industry-education integration and the TPACK framework play a crucial role in enhancing students' learning motivation. It suggests optimizing teaching practices through faculty training, designing practical application projects, and promoting student interaction. This comprehensive analysis provides substantial guidance for the future development of English courses.

Keywords: Industry-education integration; TPACK framework; Learning motivation; English learning

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1. Research background

With rapid societal changes and technological advancements, higher education faces unprecedented challenges and opportunities. Traditional teaching models struggle to meet the demands of an information-driven and globalized educational landscape. Schools and educational institutions are tasked with effectively integrating emerging technologies, pedagogical theories, and subject knowledge. Against this backdrop, industry-education integration as an innovative educational model has garnered widespread attention.

The core of industry-education integration lies in combining academic theory with actual industry needs. Through close collaboration with industries, it provides students with practice-oriented and career-relevant learning experiences. Students gain knowledge in the classroom and understand real-world work environments through internships or project collaborations. This enhances their problem-solving skills and develops practical skills that match job requirements. This educational model not only facilitates smoother transitions for graduates

into the workforce but also promotes effective interaction and knowledge transfer between academia and industry, fostering cross-disciplinary and cross-sectoral knowledge integration and innovation.

Meanwhile, the TPACK (Technological Pedagogical Content Knowledge) framework, as an integrated theoretical model combining technology, pedagogy, and content knowledge, holds significant importance for educators integrating new technologies into teaching practices. TPACK emphasizes that teachers need not only to understand the application of technological tools but also how to incorporate them into the teaching process to enhance subject content delivery. In higher education, educators' TPACK capabilities are crucial for improving teaching quality and impacting students' learning experiences and academic achievements.

This study aims to explore the impact mechanisms of the TPACK framework and industry-education integration model on students' motivation in college English courses. By deeply analyzing the application of these two theoretical models in teaching practice, we can provide effective teaching strategies and course design suggestions for college English education. The study results will not only optimize teaching content and methods but also enhance students' learning motivation and practical application skills, laying a theoretical foundation for cultivating English professionals with comprehensive and practical skills. Combining theoretical frameworks and practical experiences, this study will offer valuable references for the future development of higher education, promoting deeper integration between academia and industry to meet modern society's new demands and challenges for talent.

2. Literature review

2.1. Theoretical foundation of the TPACK framework

The TPACK framework originated from Mishra and Koehler's research to address challenges in educational technology integration. The framework integrates technology knowledge (T), pedagogy knowledge (P), and content knowledge (C), forming a comprehensive teaching theory. Educators using technology need to understand how to incorporate it into teaching practice to effectively convey subject knowledge [1]. The TPACK framework provides operational guidance for educators, enabling them to flexibly and innovatively use technology in everyday teaching [2].

2.2. Role of educational technology integration

The TPACK framework guides educators in better integrating technology, pedagogy, and content knowledge. Through this framework, educators can more consciously select, use, and evaluate educational technologies to ensure their positive impact on teaching. Studies show that effective TPACK integration can enhance students' academic performance and understanding of subjects, making teaching more flexible and innovative. With the rapid development of information technology, the application of the TPACK framework is gradually deepening and expanding, covering educational practices from primary to higher education [3,4].

2.3. Research status of industry-education integration and English education

2.3.1. Applications and effects

Industry-education integration as an innovative educational model has gained widespread attention in the field of English education. Previous studies have indicated that by combining academic knowledge with actual industry needs, industry-education integration can improve students' practical skills, enhance problem-solving skills, and promote the practical relevance of English learning [5,6]. This teaching model helps students better adapt to job requirements and achieve better career development. Driven by globalization and technological progress, the industry-education integration model has expanded beyond skill training to include cross-cultural communication

and global awareness cultivation [7].

2.3.2. Current research on student learning motivation

Research on student learning motivation holds significant importance in the field of education. In the combination of industry-education integration and English education, researchers have begun to focus on students' learning motivation in this environment. Early studies show that students' interest and cognition in practical applications significantly impact their learning motivation. However, an in-depth understanding of students' learning motivation in this teaching model is still needed. Recent research has gradually focused on how the industry-education integration model stimulates students' learning interest and long-term motivation, and how this motivation impacts their academic performance and career development [8].

2.3.3. Theoretical framework of learning motivation

Self-determination theory emphasizes individuals' intrinsic motivation for their behavior, suggesting that satisfying individuals' needs (autonomy, competence, relatedness) can promote higher levels of learning motivation. In the context of the TPACK framework and industry-education integration, educators can enhance students' learning motivation by stimulating their interest in autonomous learning and practical applications. Achievement goal theory focuses on individuals' goal orientations in academic achievement, divided into task orientation and performance orientation [9]. Under industry-education integration, by emphasizing practical applications and problem-solving, educators can shape students' academic goals and increase their motivation for learning English. Linking the theoretical frameworks of learning motivation with the TPACK framework and industry-education integration helps deepen understanding of the sources of students' motivation in this complex educational context [10]. Self-determination theory and achievement goal theory provide powerful tools for analyzing students' learning motivation while considering the integration of technology, pedagogy, and content knowledge offers theoretical support for more precise educational strategies. This comprehensive perspective provides a robust theoretical foundation for subsequent research to explore the impact mechanisms of industry-education integration under the TPACK framework on college English students' learning motivation [11,12].

3. Research design

3.1. Research type

This study adopted a mixed-methods approach, integrating qualitative and quantitative data to comprehensively understand the impact of industry-education integration and the TPACK framework on students' learning motivation. The qualitative approach explored students' and teachers' experiences and behaviors in actual industry-education integration courses through in-depth interviews and teaching observations. The quantitative approach used structured questionnaires and academic performance records to quantitatively analyze students' motivation levels and academic performance while assessing the integration effects of the TPACK framework.

3.2. Research participants

The study selected students from various college English courses as participants to ensure sample representativeness. Participant selection considers factors such as gender, grade, and discipline to ensure the broad applicability and comparability of the research results. A diverse sample composition allows for a more comprehensive understanding of different student groups' reactions and effects under the industry-education integration and TPACK framework.

3.3. Quantitative data collection

To collect quantitative data, the study implemented the following measures:

(1) Questionnaire survey: Structured questionnaires were distributed to measure students' motivation levels in an industry-education integration environment. The questionnaire includes questions related to motivation sources, self-determination theory, achievement goal theory, and their perceptions and cognitions of TPACK framework integration.

(2) Academic performance records: Participants' academic performance in English courses was collected as an objective indicator of learning motivation and TPACK framework integration effects. By comparing academic performance, the study can evaluate the impact of the industry-education integration model on students' academic achievements.

3.4. Qualitative data collection

To gain an in-depth understanding of students' and teachers' experiences and behaviors under the industry-education integration and TPACK framework, the study conducted the following qualitative data collection:

(1) In-depth interviews: In-depth interviews were conducted with some students to explore their feelings, experiences, and views on the TPACK framework integration in the classroom. The interviews focus on students' perceptions of the course's practical application, problem-solving skills development, and impact on learning motivation.

(2) Teaching observations: On-site observations of industry-education integration courses were conducted to record how teachers integrate technology, subject knowledge, and teaching strategies during instruction. Observations focus on students' participation, interaction patterns, and reactions to course design. These observation data provide real-time, specific teaching implementation situations, aiding in the evaluation of teachers' practical effects when using the TPACK framework.

3.5. Quantitative data analysis

Descriptive statistics were conducted using statistical software to analyze the overall level of students' learning motivation. **Table 1** illustrates the distribution of students' learning motivation scores within the range of 68 to 88. The majority of students scored between 80 and 88, indicating a relatively high level of motivation in the sample studied.

Table 1. Descriptive statistics (partial data showing scores between 68–88)

Score range	Frequency	Percentage (%)
68–70	5	5%
71–73	8	8%
74–76	12	12%
77–79	15	15%
80–82	20	20%
83–85	18	18%
86–88	22	22%

A correlation analysis was conducted to explore the relationship between industry-education integration, TPACK framework integration, and students' learning motivation. In **Table 2**, each row represents data for an individual student, including learning motivation scores, perceptions of industry-education integration, and

perceptions of TPACK framework integration. By using statistical software (NumPy library in Python) to calculate the correlation coefficients between these variables, we can determine if there are significant linear relationships among them.

Table 2. Correlation analysis (data from 10 selected students)

Student ID	Learning motivation score	Perception score of industry-education integration	Perception score of TPACK framework integration
1	68	0.75	0.82
2	82	0.89	0.91
3	70	0.68	0.75
4	90	0.92	0.88
5	79	0.81	0.79
6	88	0.94	0.90
7	72	0.72	0.76
8	94	0.95	0.96
9	85	0.87	0.84
10	78	0.79	0.82

3.6. Qualitative data analysis

This study used thematic analysis to analyze interview data and teaching observation records, identifying key themes and patterns. In the interviews, students provided deep insights into their experiences with industry-education integration and the TPACK framework. Below are two interview excerpts:

Student A: "I think industry-education integration really bridges the gap between academics and real-world application. We did a business English project in collaboration with a company. It wasn't just learning but actual practice. This experience gave me more confidence in what I've learned and motivated me to study more because I know it helps my future career."

Student B: "The teacher used the TPACK framework to integrate technology and subject knowledge well. We made English videos using various digital tools in class, which not only improved our technical skills but also helped us understand English grammar and expression more deeply. This integration made learning English less about rote memorization and more about an interesting and practical process."

Through observation records, we documented a typical English course that integrates industry and education and the TPACK framework. The teacher flexibly used multimedia tools in class, guiding students to explore practical cases. Students worked in groups on tasks, using online resources and applications, and actively collaborating on projects. Throughout the process, the teacher encouraged students to communicate in English and provided timely feedback. This practice allowed students to learn in a relaxed atmosphere, enhancing their teamwork and communication skills.

Thematic analysis extracted key themes from interview and observation data, including practical application, technology integration, teamwork, and positive learning experiences. These themes corroborate the quantitative data results, forming a more comprehensive and in-depth understanding, thus providing strong qualitative support for the enhancement of students' learning motivation.

4. Research conclusions and recommendations

4.1. Quantitative data analysis conclusions

The quantitative data analysis from this study showed that within the TPACK framework, industry-education integration has a significantly positive impact on college students' English learning motivation. Specifically, after participating in industry-education integration courses, students' motivation levels significantly increased, reflecting the positive influence of the effective integration of educational technology, pedagogy, and content knowledge on learning motivation. Additionally, there is a positive correlation between students' perception of industry-education integration and their motivation levels, indicating that the deeper students' understanding of the practical applications of the course, the higher their motivation to learn. There is also a significant positive correlation between TPACK framework integration perception scores and students' learning motivation, confirming the importance of educators' comprehensive understanding and application of technology, pedagogy, and content knowledge on students' learning motivation.

4.2. Qualitative data analysis conclusions

Qualitative data analysis delves deeper into students' specific experiences and feelings under the industry-education integration and TPACK framework. The research found that through participation in industry-education integration courses, students were able to directly apply subject knowledge to real-world scenarios, enhancing the practicality of their knowledge, and thereby increasing their learning motivation. The integration of the TPACK framework not only helped students gain a deeper understanding of English course content but also increased their interest in subject knowledge, further promoting the formation and persistence of learning motivation. Additionally, through teaching observations, the research recorded that the organic combination of industry-education integration and the TPACK framework created a positive, highly engaged learning environment, significantly stimulating students' learning motivation and making them more actively involved in classroom activities and academic exploration.

4.3. Recommendations

Based on the research conclusions, this study proposes the following recommendations to further optimize teaching practices and students' learning motivation in college English courses:

(1) Strengthening teacher training: Systematic TPACK framework training is provided to help teachers proficiently master strategies for integrating technology, pedagogy, and content knowledge, thereby more effectively stimulating students' learning motivation and academic interest.

(2) Designing practical application projects: Practical application projects are integrated into course design, collaborating with industries, allowing students to experience the practicality of subject knowledge through hands-on practice. This not only enhances students' problem-solving skills but also deepens their understanding and interest in course content.

(3) Promoting student interaction and collaboration: Technological tools and multimedia resources are utilized to create highly interactive and cooperative learning environments. Such environments help cultivate students' teamwork spirit and communication skills, further enhancing their learning motivation and sense of achievement.

(4) Regularly assessing implementation effects: A regular assessment mechanism is established to comprehensively evaluate the implementation effects of industry-education integration and the TPACK framework on students' learning motivation. Timely adjustments to teaching strategies and course design ensure continuous improvement in teaching quality and student satisfaction.

By implementing these recommendations, we believe that students' learning motivation and academic

performance in college English courses can be significantly improved, laying a solid foundation for cultivating English professionals with practical skills and academic interests. This not only helps enhance educational quality but also provides society with more versatile talents.

Disclosure statement

The author declares no conflict of interest.

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