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## RESEARCH ARTICLE

# Pedagogy of Petroleum English course, part B: A correlational investigation between learning motivations and learning achievements of Chinese students under MOOC-based blended modality

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## ABSTRACT

The massive open online course MOOC-based blended learning modality has gained widespread academic recognition across various fields due to the enhancement of the academic performance of students. This research focuses on exploring the learning achievements of Chinese students, who showed improved academic performance in the petroleum English course under the MOOC-based blended learning modality compared to the traditional face-to-face modality, as reported in our previous study. However, the learning motivations that contributed to their learning achievements remain unsettled. Based on exploring the correlation between the Chinese sophomore year engineering students' learning motivations in the petroleum English course and learning achievements under the MOOC-based blended learning modality, this work aimed to examine the learning motivations that permitted enhanced learning achievements. For that purpose, a series of questionnaires was given to 216 Chinese sophomore year engineering students, among whom 8 were interviewed. Based on a series of statistical analyses of the responses provided by the students, the exploratory factor analysis, reliability test, statistical description, and correlational analyses, the relationship between the learning motivations and learning achievements was assessed. The results showed that the students were both positively intrinsically and extrinsically motivated, which was conducive to fostering the learning achievements, but the extrinsic motivations, having the descriptive aspects of getting a high-paying position, significantly contributed to this trend, based on the results of the loading factor. As a result, a stronger statistical correlation between the extrinsic motivations and learning achievements [ca.  $R^2=0.601$  with Sig. (2-tailed)  $<0.001$ ] was observed versus between intrinsic motivations and learning achievements [ca.  $R^2=0.425$  with Sig. (2-tailed)  $<0.001$ ]. With respect to these findings, future studies for the global contextualization frame were recommended.

## KEYWORDS

Blended learning–learning motivation–learning achievements–petroleum English–correlation analysis

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## 1. Introduction

In petroleum engineering, student training must align with modern industrial demands and academic syllabus requirements. Nowadays, to expand their activities internationally smoothly, the domestic and foreign petroleum industries have given priority to professionals with strong English-language competencies. Aligning with this objective, Petroleum English, a specialized course that aims to develop the English cognitive skills of students in order to conveniently communicate with peers in English within the petroleum and related industries, has been integrated into the academic curriculum. The key contents of the course encompass basic knowledge related to petrochemicals, industry terminology, oil and gas development, and related industrial sectors. However,

as the course was typically taught based on a rigid traditional learning modality in China, shyness and anxiety predominated among students, in combination with the fact that they spent extended time on note-taking tasks, which negatively limited the acquisition of cognitive competencies (Ebrahimi, 2025), the hunting of alternative teaching methods to foster students' willingness, classroom interactions, collaboration, and accessibility in English has been prioritized. This reshaped the pervasiveness of the educational curricula landscape by shifting the traditional classroom teaching to computerized classroom teaching or even a blended teaching classroom to afford a more stimulating experience.

Benefiting from the advancement of technology, blended learning modality has lately emerged as an efficient teaching approach since it integrates the traditional teaching modality with the online one, especially massive open online courses (MOOCs) to offer a time and cost-effectiveness which extensively improves the flexibility, pedagogical activity, and joyfulness of students' learning experiences with distinct learning potentialities (Graham, & Halverson, 2023; Hussain et al., 2020; Malekigorji & Hatahet, 2020). It can also stimulate students' commitment and interaction with peers and instructors by smoothing both synchronous and asynchronous educational and acquisition of cognitive competencies (Medina, 2018). Previous reports focusing on the students' and instructors' perceptions under a blended learning ecosystem highlighted the significant improvement in learning achievements (Zhang et al., 2025; Pinto-Llorente et al., 2017; Tosun, 2015; Wichadee, 2017; Reich, 2015). Though the adoption of blended teaching modality has attracted a great interest in the academic institutions (Reich, 2015; Yilmaz et al., 2021; Goldberg & Crocombe, 2017), this teaching format has not reportedly fulfilled the students' expectations and achieved the contemplated noticeable efficacy yet (Mirriahi et al., 2015). In response to these, studies have been carried out to identify the factors that hinder the smooth and successful implementation of this teaching modality in various fields of education (Tshabalala et al., 2014; Yang & Pu, 2022). However, reports based on investigating the specific factors that may influence the students' learning achievements in a course of petroleum English under the blended modality are scanty in the published literature. Therefore, the necessity to consider the contributing factors associated with technicality and instructionally, such as learning motivations, which is considered the most relevant student factor impacting the learning achievements. This investigation attempted to examine the correlation between the learning motivations and learning achievements in the petroleum English course under MOOC-based blended learning modality using a series of statistical analyses, which is beneficial in establishing a deeper insight into the extent how which various learning motivations impact the learning achievements. This, to actively favor an efficient learning ecosystem.

## **2. Blended Learning**

### **2.1 Blended learning modality**

The twenty-first-century education landscape has witnessed the advent of technological breakthroughs by integrating computerized learning into the traditional one to implement a blended learning modality. In other words, blended learning modality is defined as a thoughtful, integrative way to acquire cognitive knowledge, by combining the traditional face-to-face classroom learning and computer-based one, which aligns with the benefits of synchronous and asynchronous learning (Wichadee, 2017). For instance, various research teams defined a blended learning modality as a compensatory learning to the traditional face-to-face classroom learning using synchronous and asynchronous learning based on internet-based technology. Moreover, it can also combine distinctive learning approaches and styles, including videotape, web-based learning, electronic-based performance system, and traditional classroom learning, (Lim & Morris, 2009; So & Brush, 2008; Soncin et al., 2022). By assessing the students' perceptions and satisfaction towards blended learning modality (Li et al., 2025; Unger et al., 2022; Alwadood et al., 2023) reported that the students actively supported this learning format. The blended learning modality can be integrated into distinct courses with respect to various ways, including the use of online courses (ca., small private online courses and massive open online courses) and social media (ca., Skype, Facebook, WhatsApp, etc.). Zhang et al. designed a MOOC-based blended learning histology course, which was more effective in improving students' academic achievements than face-to-face classroom learning alone and online learning alone (Zhang et al., 2025). Hall et. Al integrated Facebook into the traditional face-to-face learning to supplement instruction in a blended course in business and education. Their results revealed students' better understanding of the course (Hall et al., 2017). Moreover, other studies based on English language learning demonstrated that the blended learning format enhanced students' cognitive skills, including speaking, writing, listening, and reading (Wichadee, 2017; Hall et al., 2017; Obari & Lambacher, 2014). Additionally, the blended learning format was also identified to foster students' learning motivation, self-determination, satisfaction, conviction, joyfulness, and responsibility for learning (Shams, 2013; Shih, 2011). Considered as one of the most prominent characteristics that impacts the students' behavior and learning achievements under the blended learning modality, individual academic motivation has been extensively investigated (Imlig-Iten & Petko, 2018; Kintu et al., 2017; Sirisakpanich, 2022; Mädamürk et al., 2020).

### **2.2 Learner motivation**

Learner academic motivation is a critical factor in learning because it impacts the knowledge acquisition; thus, the instructor must develop an understanding of the academic motivation under the blended learning modality (Firat et al., 2018; Yusoff et al., 2018). Over time, the literature is enriched with various conceptual views of academic learning motivations.

According to Gardner, academic motivations can be classified as integrative motivation, which is related to the learners' desire to fulfil an instructional requirement to enable them to fluently communicate and smoothly integrate into the foreign culture, whereas instrumental motivation focuses on the utilitarian and realistic reasons for learning a language (Gardner, 1985). Crookes and Schmidt, who classified motivation into intrinsic and extrinsic ones, stated that, they can be used for the acquisition of cognitive competencies while language learning (Crookes & Schmidt, 1991). More specifically, learners with intrinsic motivation are engaged in learning tasks because of curiosity and difficulties. In contrast, learners with extrinsic motivation are involved in the learning activities attributed to external factors, including grades and rewards (Hsieh, 2014). Ryan and Deci speculated that intrinsic motivation refers to an active integrative trend that is associated with the interest and curiosity driving satisfaction and joyfulness. In contrast, the authors perceived that extrinsic motivation is related to actions caused due to external desire, not by any other factor than intrinsic learner satisfaction (Ryan & Deci, 2020). The same research team reported four subcategories of extrinsic motivation in self-determination theory (SDT), which include external regulation, introjected regulation, identified regulation, and integrated regulation (Ryan & Deci, 2020). As both intrinsic motivation and extrinsic motivation are not contradictory, the extrinsic one is interiorized and independent, and extrinsically motivated actions can impact the intrinsic motivation by fulfilling self-determination, skills, and corresponding needs (Ryan & Deci, 2020). Based on SDT, the motivation can be split into autonomous motivation, which encompasses both intrinsic motivations and extrinsic motivations, and controlled motivation, which comprises external regulation and introjected regulation (Ryan & Deci, 2020; Deci & Ryan, 2008).

By refining the abovementioned motivations, in this research, it is assumed that the motivation was composed of intrinsic motivation and extrinsic motivation. Reports on academic motivations have debated the structural component of academic learning motivation, subsequently assessing the achievements of students' motivations, the association between learning motivations and students' gender and local regions, and examining the influencing factors with respect to learning achievements under traditional face-to-face learning ecosystems (Carreira, 2011; Saito et al., 2016; Tokan & Imakulata, 2019; Yang, 2018). However, in recent years, the pervasiveness of computer-based technology has captivated the attention of the research community, and studies have focused on the level of academic learning motivation, as well as factors contributing to students' motivation throughout the age spectrum under an internet-based learning ecosystem. In addition, a list of strategies, including project-based digital storytelling (Hung et al., 2012), ubiquitous games (Liu & Chu, 2010), and mobile gamification (Su & Cheng, 2015), has been investigated for improving students' learning motivations. Besides, the influence of students' learning motivation on learning in computer-based learning ecosystems has been pragmatically assessed (Law et al., 2010; Lim & Kim, 2003).

Recently, our research team reported a comparative study on academic performance between traditional face-to-face learning modality and MOOC-based blended learning modality in the petroleum English course. It was established that the students' performance under the MOOC-based blended learning modality outperformed that of the traditional face-to-face learning modality. However, the learning motivations that contributed significantly to enhancing the learning achievements and the correlations between the corresponding factors still remain unsettled. Therefore, in this research, an attempt has been made to explore the factors influencing Chinese students' learning motivation on learning achievements under the MOOC-based blended learning modality in the petroleum English course. Based on the research background, the following questionnaires were formulated;

- I. What are the Chinese engineering students' key learning motivations in the petroleum English course under the MOOC-based blended learning modality?
- II. What are the Chinese engineering learning achievements under the MOOC-based blended learning modality?
- III. How do the Chinese engineering students' learning motivations impact the learning achievements under the MOOC-based blended learning modality?

### **3. Research methodology**

#### **3.1 Population characteristics**

In this research, a total of 216 sophomore year students, comprising 124 males and 92 females, majoring in petroleum engineering at a Chinese university, were randomly selected. Among the population, 8 students codified as S1 to S8 were selected for an interrogative discussion. Before being given the questionnaires, they were informed of the objective of the research, provided written consent, and expressed willingness to be part of the survey. The students were acquainted with the MOOC-based blended learning modality as they had attended other petroleum engineering-related courses (ca., rock mechanics). In the course of petroleum English, the students attended traditional face-to-face learning instruction once a week, whereas the internet-based learning instruction was taken at any time on the MOOC platform.

#### **3.2 Materials**

Questionnaires were designed to assess the students' learning motivations and learning achievements taught in petroleum English with respect to learning activities listed in our previous report under the blended learning modality (Tchameni & Nagre, 2025). The designed questionnaires were composed of two sections. Firstly, the section related to characteristics (gender and grade for national-level university entrance examination), whereas the other section is composed of 19 descriptive aspects on learning motivation and students' learning achievements under the MOOC-based blended learning modality. It is worth noting that these

aspects were selected prior to asking while interviewing the students, "What could be the motivating reason for learning petroleum English under MOOC-based blended learning modality?" With respect to their responses, the keywords were compiled and classified, from which the two key motivational characteristics were selected via assessment of the students' motivation as listed in Table 1.

- I. Students' petroleum English academic learning motivation predominantly focuses on their perspectives and objectives.
- II. Students' objectives for learning petroleum English were predominantly integrative (ca., communicating with foreign professionals, smooth adaptation into multicultural ecosystems) and instrumental (ca., become well-knowledgeable, getting a high-paying position).

**Table 1:** Motivational aspects of the students interviewed

Motivation	Number of interviewees	Code
Communicate with foreign professionals	6	S1, S3, S4, S6, S7, S8
Academic educational requirements (passing exam, completing learning requirements)	2	S2, S5
Smooth adaptation into multicultural ecosystems	1	S2
Obtain a good grade	2	S3, S7
Get a high-paying position	8	S1, S2, S3, S4, S5, S6, S7, S8
Become well-knowledgeable	2	S3, S7
Limited optional course selection	1	S5

Subsequently, the Attitude-Motivation Test Battery (AMTB) proposed by Gardner (Gardner, 1985) was adapted to the students' responses, and learning motivations, including attitude towards petroleum English mastery, interest towards the learning process, integrative motivations, and instrumental motivations, were used to understand the students' learning motivation-attitude towards the petroleum English course, which impacts their learning achievements.

For this purpose, descriptive contents used to evaluate the motivational aspects in correlation with the interest in mastery of the petroleum English course, attitude towards learning the petroleum English course, integrative motivation, and instrumental motivation were listed in Table 2.

**Table 2:** Aspects for motivational learning in petroleum English

Aspect	Content
Interest in mastery of the petroleum English course	I am interested in learning petroleum English
Attitude towards learning the petroleum English course	It is necessary to complete the petroleum English based on the syllabus
Integrative motivation	It is crucial to obtain a good grade
	It is relevant as it will imbue me with the capability to fluently communicate with foreign experts
	It is relevant as I will be able to smoothly adapt to multicultural ecosystems
Instrumental motivation	I learn petroleum English to get a high-paying position
	I learn petroleum English to become well-knowledgeable in the field
	I learn petroleum English due to the limited optional course selection

As listed in Table 2, the selected aspects corresponding to learning achievements were expected to evaluate the efficiency of the MOOC-based blended learning modality in enhancing students' cognitive competencies in speaking, writing, reading, and listening. Thus, actively improve their self-directed learning, self-confidence, accountability, joyfulness, and satisfaction (Wichadee, 2017; Shih, 2011). The written questionnaires were designed based on a 5-point Likert scale, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

### **3.3 Data collection and statistical assessment**

As abovementioned, two types of data were retrieved from the questionnaires and interview discussions. On the one hand, a total of 216 students were given a list of questionnaires, and each student took roughly 15 minutes to complete and submit their responses, which was rated at 99.08% (214 responses). The retrieved data from the questionnaires were analysed using IBM SPSS Amos version 23.0. The procedural steps were as follows: First, the extraction and elimination of the aspects that did not satisfy the factor extraction conditions was carried out via exploratory factor analysis (EFA). Second, the internal consistency of each aspect was evaluated using Cronbach's alpha value. Third, exploratory data analysis and correlation analysis were then conducted. On the other hand, the 8 randomly selected students were interviewed, and the questionnaires were as follows;

- I. What is your perception regarding MOOC-based blended learning modality?
- II. How do you study petroleum English under the MOOC-based blended learning modality?
- III. What and why are the strategies that you used to study the petroleum English course out of the classroom ecosystem?
- IV. What are the reasons motivating you to study the petroleum English course?
- V. What impacts does the MOOC-based blended learning modality have on your petroleum English course learning competencies?

Subsequently, the responses to the questionnaires were registered and analysed for data interpretation.

## 4. Results and Discussion

### 4.1 Results

#### 4.1.1 Exploratory factor analysis and reliability of the research

In order to perform the exploratory factor analysis and assess the factor structure of the original 19-questionnaires related to the students' learning motivation and learning achievements under the MOOC-based blended learning modality. For the first attempt of the exploratory factor analysis, the principal axis factoring (PAF) and oblique rotation were used. The statistical key parameters are listed in Table 3. As observed, the Kaiser-Meyer-Olkin (KMO) statistic value was not only above 0.7, but also the parameters related to the Bartlett's test of sphericity (ca. Chi-Square, degree of freedom (df), and  $p$  lower than 0.001) were significant, inferring the adequacy of the sample for performing the exploratory factor analysis. Due to cross-loading or low factor loadings, two descriptive aspects of the learning achievements were eliminated during the second attempt at the exploratory factor analysis, and the corresponding results of the adequacy test listed in Table 3 confirm that the sample size and the collected data met the requirements for conducting the factor analysis. During this analysis, three latent variables were extracted by setting eigenvalue and loading factor both  $> 1.0$  and  $> 0.4$ , respectively.

**Table 3** Key parameters for the adequacy test

Number of attempts	KMO	Chi-Square	df	Level of significance
First	0.885	1956.5	234	$< 0.001$
Second	0.878	1574.3	184	$< 0.001$

After completing the exploratory factor analysis, the questionnaires were redesigned into 17 descriptive aspects, and they were found to match 3 measurement scales as listed in Table 4. The first measurement scale, that is, Intrinsic Learning Motivation (ILM), which refers to autonomy and is associated with interest, curiosity, joyfulness, and satisfaction. Among the four descriptive aspects, "interested in learning petroleum English course (ILM1)", "imbuing me with the capability to communicate with foreign experts (ILM2)", and "enable smooth adaptation into a multicultural ecosystem (ILM3)" are reasons related to intrinsic interest, intrusiveness, and integrative motivation; whereas "Furthering study abroad (ILM4)" is related to the instrumental motivation according to (Gardner, 1985) albeit it obviously reinforces students' autonomy and skills needed. For the second measurement scale [ca. Extrinsic Learning Motivation (ELM)], the descriptive aspects include "completing the course based on the syllabus (ELM1)", where both "getting a high-paying position (ELM2)" and "obtaining a good grade (ELM3)" significantly influence the external motivations that drive nervousness and pressure among students. The third measurement scale, that is, learning achievements, which is related to cognitive skills acquisition, varies from LA1 to LA11 as listed in Table 4. Additionally, the loading factor, eigenvalue, and variance explanation rate are listed in the same table. It was found that the extraction factors for the questionnaire survey accounted for 57.886% and the corresponding factor loadings spanned from 0.411 to 0.727.

**Table 4:** Results of the exploratory factor analysis

Learning sub-category	Measurement Scale	Descriptive aspects	Factor loading	Eigenvalue	% of Variance
Learning motivations	Intrinsic Learning Motivation (ILM)	Interested in learning petroleum English (ILM1)	0.540	2.654	13.985
		Imbuing me with the capability to communicate with foreign experts (ILM2)	0.630		
		Smoothing adaptation into a multicultural ecosystem (ILM3)	0.645		
		Furthering study abroad (ILM4)	0.420		
	Extrinsic Learning Motivation (ELM)	Completing the course based on the syllabus (ELM1)	0.413	3.224	16.753
		Getting a high-paying position (ELM2)	0.727		
		Obtaining a good grade (ELM3)	0.710		
		Constraining due to the limited optional course selection (LA1)	0.411		

Learning achievements	Enhancing my autonomy in the field (LA2)	0.513		
	Enhancing my confidence in the field (LA3)	0.507		
	Enhancing petroleum English satisfaction (LA4)	0.602		
	Enhancing petroleum English perseverance (LP6)	0.518	2.734	14.024
	Enhancing the joyfulness of learning petroleum English (LA7)	0.527		
	Enhancing my English-speaking competencies (LA8)	0.615		
	Enhancing my English-reading competencies (LA9)	0.592		
	Enhancing my English-writing competencies (LA10)	0.585		
	Enhancing my English-listening competencies (LA11)	0.583		

The internal consistency of the revised 17-questionnaire was assessed, and the results are listed in Table 5. As indicated, the values of Cronbach's alpha of the corresponding three extracted measurement scales were greater than the threshold value (ca 0.7) as they spanned between 0.801 and 0.852, indicating the reliability of the questionnaires to describe the latent variables.

**Table 5:** Results of the reliability test analysis

Learning sub-category	Measurement scale	Cronbach's alpha
Learning motivations	Intrinsic Learning Motivation (ILM)	0.801
	Extrinsic Learning Motivation (ELM)	0.852
Learning achievements (LA)		0.824
	Overall	0.812

#### 4.1.2 Statistical description and correlational analysis

Table 6 lists the results of the statistical description analysis between the learning motivations and the learning achievements in the MOOC-based blended learning modality. As can be noticed, in general, for the descriptive aspects corresponding to the learning motivations, those of ELM are higher than those of ILM, reflecting the significant extrinsic motivation of the students for mastering petroleum English under the blended learning modality. In detail, the descriptive aspect "Getting a high-paying position (ELM2)" had a mean value of 4.10, showing the strongest reasons for students to learn the petroleum English course under a blended ecosystem. Compared to the former sub-category, the mean values of the descriptive aspects associated with learning achievements were generally lower, but exceeded 3.5, with the "enhancing my autonomy in the field (LA2)" scoring the highest mean value (ca. 4.01).

**Table 6:** Results of the statistical description between the learning motivation and learning achievement in the MOOC-based blended learning modality

Learning sub-category	Measurement Scale	Descriptive aspects	Minimum value	Maximum value	Mean	Standard deviation
Learning motivations	Intrinsic Learning Motivation (ILM)	Interested in learning petroleum English (ILM1)			3.75	0.82
		Imbuing me with the capability to communicate with foreign experts (ILM2)	1	5	3.73	0.64
		Smoothing adaptation into a multicultural ecosystem (ILM3)			3.87	0.88
		Furthering study abroad (ILM4)			3.80	0.91
	Extrinsic Learning Motivation (ELM)	Completing the course based on the syllabus (ELM1)	1	5	3.82	0.92
		Getting a well-paid position (ELM2)			4.10	0.98
		Obtaining a good grade (ELM3)			3.83	0.91
		Constraining due to the limited optional course selection (LA1)			3.01	0.52
		Enhancing my autonomy in the field (LA2)			4.01	0.95

Learning achievements	Enhancing my confidence in the field (LA3)			3.52	0.71
	Enhancing petroleum English satisfaction (LA4)	1	5	3.81	0.91
	Enhancing petroleum English perseverance (LA6)			3.45	0.68
	Enhancing the joyfulness of learning petroleum English (LA7)			3.72	0.76
	Enhancing my English-speaking competencies (LA 8)			3.90	0.91
	Enhancing my English-reading competencies (LA9)			3.76	0.77
	Enhancing my English-writing competencies (LA10)			3.80	0.91
	Enhancing my English-listening competencies (LA11)			3.86	0.94

The Pearson correlation analysis was performed to statistically describe the significance of the relationship between the learning motivations and learning achievements, and the results are indicated in Table 7. As shown, the relationship between the learning sub-categories indicated a positive linearity between the two variables, though the statistical significance is dissimilar. In detail, a moderate statistically significant was observed between ILM and ELM as indicated in Table 7 (ca.  $R^2=0.425$  with Sig.(2-tailed)  $<0.001$ ). From the same table, it can be seen that there was a strong statistically significant correlation between the ELM and LA [ $R^2=0.601$  with Sig. (2-tailed)  $<0.001$ ]; whereas there is a weak statistically significant correlation between the ILM and LA, as listed in Table 7.

**Table 7:** Results of the correlations between the learning motivations and learning achievements in the MOOC-based blended learning ecosystem

Parameters		ILM	ELM	LA
ILM	Pearson correlation	1	0.425**	0.301**
	Sig.(2-tailed)		$<0.001$	$<0.001$
	N	216	216	216
ELM	Pearson correlation	0.425**	1	0.601**
	Significance (2-tailed)	$<0.001$		$<0.001$
	N	216	216	216
LA	Pearson correlation	0.301**	0.601**	1
	Significance (2-tailed)	$<0.001$	$<0.001$	
	N	216	216	216

**Note:** \*\* Correlation is significant at the  $p < 0.01$  (2-tailed); ILM: Intrinsic Learning Motivation; ELM: Extrinsic Learning Motivation; LA: learning achievements

Furthermore, the regression analysis was conducted to examine the impact of ILM and ELM on LA, and the key results are listed in Table 8. During this analysis, the ILM and ELM were used as independent variables while the LA was used as the dependent variable. As indicated in Table 8, the R-value was obtained as 0.745, which was indicative of the positive linearity between the independent variables on LA. As shown in the same table, the coefficient of determination ( $R^2$ ) was 0.555, implying that the independent variables described 55.5% of the overall variance in LA. Moreover, the adjusted  $R^2$  was obtained as 0.551, which further demonstrated the good statistical fitness of the model. Besides, the Durbin-Watson parameter (ca. 1.951) indicated that there was no presence or minimal autocorrelation in the model.

From Table 9, based on the unstandardized coefficients (B), it can be observed that ELM had a greater impact on students' LA ( $B=0.477$  with Sig.  $<0.001$ ) in comparison to ILM ( $B=0.231$  with Sig.  $<0.001$ ). The beta coefficient also ascertains this finding, as a value of 0.525 was obtained for ELM, whereas that of ILM was recorded as 0.254. Overall, these results supported that ELM had a stronger impact in enhancing the LA of the students under the MOOC-based blended learning modality.

**Table 8:** Results of the regression model

Parameters	R	$R^2$	Adjusted $R^2$	Standard Error of the Estimate	Durbin-Watson
Values	0.745	0.555	0.551	0.44331	1.951

**Table 9:** Results of regression analysis

Independent variables <sup>a</sup>	Unstandardized coefficients		Standardized coefficients		
	B	Standard error	Beta	t	Sig.

ILM	0.231	0.054	0.254	4.652	<0.001
ELM	0.477	0.047	0.525	8.951	<0.001

a. Dependent variable: Learning achievement; ILM: Intrinsic Learning Motivation; ELM: Extrinsic Learning Motivation

## 4.2 Discussion

As listed in Table 4, the learning motivations with respect to LA of Chinese students taught in the petroleum English course under the MOOC-based blended learning modality encompass both ILM and ELM. The ILM includes being interested in learning the petroleum English course, imbuing the capability to communicate fluently with foreign experts, smoothing adaptation into a multicultural ecosystem, and furthering study abroad, whereas the ELM consists of completing the course based on the syllabus, getting a high-paying position, and obtaining a good grade. Based on the results of statistical description analysis listed in Table 6, it was found that the ELM had a greater impact on LA than ILM. Yang et al. came across a similar conclusion in the case of English as a Foreign Language (EFL) in Chinese universities, as they observed that students demonstrated stronger extrinsic motivations than intrinsic motivations to learn the English course (Yang, 2018). It is worth mentioning that, while interviewing the students regarding their motivations to learn the petroleum English course, out of 8 students, 6 respondents indicated completing the course and getting a high-paying position, their strongest motivation among the students taught under the MOOC-based blended learning modality. This could be ascribed to the fact that, as China's petroleum industry expands its activities internationally, the expected workers' salary grows, and employers seek versatile professionals who can take much more responsibility with expertise not only in the field but can also communicate fluently in both written and spoken English. This statement can be correlated to the following replies from students (S2 and S4);

Mastering the petroleum English course was considered crucial to getting a high-paying position in the petroleum industry. Currently, as China's petroleum engineering activities are expanding across the globe (ca. Middle East, America, Europe, and Africa etc.), expatriate Chinese workers receive better pay. Simply because employers attach great importance to professionals with strong knowledge in English (Student S2).

Getting a high-paying position in the petroleum industry is highly competitive; thus, mastering professional knowledge in English is beneficial for standing out among other job seekers (Student S4).

Students' LA under the MOOC-based blended learning modality was also examined based on their opinions. Based on the results listed in Table 6, it was found that the MOOC-based blended learning modality significantly enhanced the autonomy, satisfaction, and joyfulness of the students, which aligned with previous works and highlighted a stronger autonomy of students when taught under a blended modality, as learning under this format enhances the students' perseverance and confidence (Obari & Lambacher, 2014; Lungu, 2013). Moreover, the cognitive skills, including speaking, reading, writing, and listening, were fostered, consistent with previous published work (Wichadee, 2017; Shih, 2011; Lungu, 2013). Among the studied descriptive learning achievements, the blended learning modality significantly enhanced the students' autonomy, inferring that combining the traditional face-to-face learning modality with the internet-based learning modality can prominently enhance students' autonomous characters (Wang & Zhang, 2022; Heriyawati et al., 2023). These results could be attributed not only to the flexibility of the schedule but also to the fact that the students can learn at their own pace online.

While interviewing the students, regarding the response to the questionnaire related to the strategies employed by students to study the petroleum English course out of the classroom and why they use this learning approach, the following answers were provided;

MOOC-based blended learning modality affords flexible learning paths because students can select resources, including videos, quizzes, etc, based on their personal objectives (Student S1).

When studying under the MOOC-based blended learning modality, I can self-paced progression because the online course allows me to review learning materials as needed, which significantly minimizes dependency on instructors (Students S3).

For me, learning under a blended modality is beneficial for collaborative online activities because though panel discussions and team projects promote collaborative learning, they also stimulate the development of self-problem-solving capabilities (Students S6).

From the analytical path indicated in Table 1, two sub-categories of learning motivations (ca. ILM and ELM) were identified, and it was noticed that the learning motivations were positively correlated with students' LA taught in petroleum English under the MOOC-based blended learning modality. These findings align with those reported by Tokan and Imakulata, which were based on language learning competencies (Toka & Imakulata, 2019). Besides, our results demonstrated that the students were more extrinsically motivated than intrinsically motivated to enhance their LA. Correspondingly, students extrinsically motivated in getting a high-paying position, obtaining a good grade, and completing the course based on the syllabus, seemingly fostered their LA. These results are consistent with those reported by Rehman et al., who also found that ELM was the stronger precursor in the acquisition of English competencies (Rehman et al., 2023).

Out of the four corresponding descriptive aspects listed in ILM, smoothing adaptation into a multicultural ecosystem is the most relevant determinant of students' LA. Students' dedication to learn petroleum English seems to be immersed in a self-



regulated learning process and actively monitor and manage their own learning pace effectively in blended learning modality since ILM is intimately connected to the self-regulation process and schedule control (McWhaw & Abrami, 2001). Besides, the ILM has an enduring influence on students' learning competencies, fostering sustainable dedication (Lim & Kim, 2003). Additionally, smoothing adaptation into a multicultural ecosystem, which has a fundamental prerequisite of understanding the foreign culture, is of great relevance for predicting students' enhanced learning skills, as it constrains students to be immersed in English cultures and habits, which further reinforces their interest in smooth adaptation into a multicultural ecosystem (Lim & Kim, 2003).

Concerning the ELM descriptive aspects, getting a high-paying position is the most relevant predictor of the LA. This might be presumably due to the fact that, as the societal pressure rises, getting a high-paying position for working abroad becomes an excellent option, especially in fields like the oil and gas industry, which often requires professionals with versatile competencies and a strong English language profile. Although getting a high-paying position is an indirect achievement, it can directly influence students' learning dedication (Kocsis & Pusztai, 2024). In the current society, in combination to financial security desire, with fancy higher living standard is a significant determinant of affording a better life, securing the future. It also provides a beneficial feeling like belonging to a powerful network and an enhanced reputation.

Based on the aforementioned discussion, ELM2 (ca., getting a high-paying position) significantly contributed to enhancing the students' LA compared to the ILM taught petroleum English course under a MOOC-based blended learning modality. The high level of university students being extrinsically motivated is also supported by the stronger and positive statistically significant correlation between ELM and LA than that of ILM and LA, according to the Pearson correlation coefficient, as indicated in Table 7. This finding corroborates that of Iraqi and Hind, who also observed the same trend among university EFL students in Morocco, Tunisia, and Egypt (Iraqi & Hind, 2025). This study demonstrates that the statistical results related to descriptive aspects of ILM are not as significant as those of ELM, which implies that substantial work is needed to further develop this measurement scale under this blended format in the petroleum English course. Therefore, instructors and universities are recommended to integrate game theory strategies with competitive learning (Burguillo, 2010), implement digital storytelling strategies (Hung et al., 2012), and adopt university-enterprise cooperative practical training. Adopting these measures would favour an immersive learning ecosystem via international internships and multicultural knowledge exchange, which could foster intrinsically motivational aspects of the students taught in petroleum English under a MOOC-based blended learning modality.

## 5. Conclusions and recommendations

This research explores the relationship between the learning motivations and the learning achievements of Chinese students in the petroleum English course under a MOOC-based blended learning modality. It was found that both intrinsically and extrinsically motivated students positively impact the LA, but the latter yielded a more significant impact than the former. The extrinsically motivated students with an interest in getting a high-paying position are the most prominent precursor for predicting the LA. As a result, a stronger statistically significant correlation between the ELM and LA ( $R^2=0.601$  with Sig. (2-tailed)  $<0.001$ ) was noticed versus that recorded between the ILM and LA, which was slightly weaker ( $R^2=0.325$  with Sig. (2-tailed)  $<0.001$ ).

However, as this study was conducted particularly in the Chinese educational and societal context, these findings are not universal nor be generalized to other educational ecosystems, as the students could face different societal realities. Therefore, future research should be dedicated to comparing the learning motivations with respect to learning achievements from students in other non-English speaking countries by collecting more quantitative data to provide more pertinent support to ascertain the positive association between the learning motivations and learning achievements. And what strategies should be adopted to foster the learning motivation that failed to significantly improve the learning achievements under the blended learning modality?

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