



A SmartPLS4-based CB-SEM confirmatory factor analysis: a case of speaking needs for Chinese business English undergraduates

KE HU^a  

ASMAA ALSAQQAF^b  

^aFaculty of Education and Sports Studies, Universiti Malaysia Sabah (UMS), Malaysia

^bCentre for the Promotion of Knowledge and Language Learning (PPIB), Universiti Malaysia Sabah (UMS), Malaysia

Abstract

Over the past decade, there has been an increasing emphasis on English for Specific Purposes (ESP) within China's higher education language programs. However, the shift towards ESP presents a multifaceted challenge, particularly for business English teaching at higher education, where speaking proficiency is crucial yet often falls below expectations. Considering these issues, the authors of this study developed a scale based on relevant literature to pinpoint students' needs for Oral Business English (OBE) instruction, and to explore the interplay among constructs within the scale that define these needs. This quantitative study employed a two-phase approach, utilizing separate datasets and different sample sizes of Chinese business English undergraduates selected through simple random sampling. Phase one (N = 52) leveraged SPSS 29 for exploratory factor analysis (EFA), while phase two (N = 396) utilized SmartPLS4 for covariance-based structural equation modeling (CB-SEM) in confirmatory factor analysis (CFA). The findings reveal that the undergraduate respondents grapple with a total of five distinct needs related to OBE instruction. These include three target needs: difficulties in oral communication, oral challenges in collaborative engagement, and required speaking activities. Additionally, there are two learning needs: perceived learning styles and perceived course satisfaction. Significantly, as perceived by these undergraduate respondents, each of these needs was found to have a substantial impact on the effectiveness of OBE instruction in China.

Keywords: ESP; needs analysis; oral business English; scale development; SmartPLS4

Introduction

Incorporating English as a Foreign Language (EFL) into China's education system is essential for nurturing students' abilities to communicate domestically and globally. Typically, English teaching or English majors at Chinese universities have focused on providing general language instruction, often called English for General Purposes (EGP), within an academic context. However, the low levels of student satisfaction and proficiency in English following these courses necessitate a thoughtful reevaluation and further development of China's English language educational structure. In harmony with China's Belt and Road Initiative, the English language is pivotal in conveying China's story and bolstering cultural and economic ties. Consequently, achieving the necessary proficiency in English is fundamental to enhancing internationalization and facilitating the exchange and movement of students and educators (Lasekan et al., 2023). Apparently, teaching English for Specific Purposes (ESP) could be a revitalization method. Indeed, while most research in ESP has concentrated on reading and listening skills, the speaking component has often been overlooked, despite its importance (Alsamadani, 2017). Speaking is frequently undervalued in English language instruction (Sada et al., 2023). However, proficient communication skills, particularly speaking, can significantly enhance workplace success and effectiveness (Aichhorn & Puck, 2017; He & Li, 2023). EFL educators and policymakers face the ongoing challenge of aligning students' needs and goals with the creation of innovative teaching strategies. This challenge is amplified by the diverse language backgrounds of learners and the constantly evolving demands of the international business landscape (Lasekan et al., 2023). To meet these dynamic requirements, a flexible and progressive approach to curriculum development is essential, adapting to current needs while anticipating future trends (Hu & AlSaqqaf, 2023). Against this backdrop, this study utilizes a needs analysis approach to identify specific requirements for ESP courses, particularly in the domain of business. By examining the perceptions of relevant stakeholders, the study aims to inform the development of ESP courses in Chinese universities and colleges specializing in business English programs. This focus is within the context of the official establishment of such programs since 2007 in China (Lu et al., 2019). Using a questionnaire, the study aims to uncover valuable insights that can guide the design of ESP courses tailored to these stakeholders' unique needs and perspectives.

Literature Review

Business English in China

Developing language proficiency and a solid understanding of business practices is crucial for international trade and business success. This impact is particularly significant in the context of China's reform and opening-up policy and revitalization efforts (Kam, 1988). Among various languages, English stands out as the most practical and widely used lingua franca for business communication worldwide (Roshid et al., 2022). The introduction of ESP has significantly contributed to the growth of EFL. Business English, a specialized subset of ESP marked by its interdisciplinary nature, has emerged because of globalization (Xie, 2024). Specifically in China, business English has been accredited as one of the formal English-related disciplines for over a decade at over 400 universities and colleges (Ai et al., 2019). It is anticipated that more Chinese institutions of higher learning are expected to introduce business English disciplines moving forward.

Nonetheless, the present quality of business English teaching falls short of what is desired (Lu et al., 2019). Chinese undergraduates majoring in business English express challenges related to professional terminology, business knowledge, learning objectives, teaching content, and outdated teaching methods, which hinder effective oral communication (Xie, 2023;

Ruan, 2019). This situation may be influenced by some in-service business English teachers transitioning from teaching English for General Purposes (EGP) to business English (Ai et al., 2022). These English teachers face significant changes and identity challenges within their profession, a topic that has received limited scholarly attention. Introducing the New Curriculum Standards for teaching English in China further complicates this landscape. The new curriculum proposes a redefined role for English language teachers, with new demands and expectations (Lei & Medwell, 2022). When it comes to acquiring language competency in business English communication, speaking skills are often identified as a weak point in instructional design (Niemiec, 2017) and emphasized in business English teaching (Lasekan et al., 2023). This shift could potentially make business English teaching even more challenging, highlighting the need for further research and support for teachers navigating these evolving roles and responsibilities. Given that, to bridge the gaps mentioned and assist in the transition of Chinese EFL teachers' identities, a revised needs analysis tool would be effective for identifying weaknesses in students' language abilities, particularly in speaking skills.

Needs Analysis

A needs analysis serves as an indispensable tool for ESP practitioners, enabling them to pinpoint the essential requirements and competencies their students must acquire (Niemiec, 2017). This analytical approach informs various pedagogical decisions, from curriculum development to material selection, teaching methods, and evaluation strategies (Flowerdew, 2012). Despite its significance, a common shortfall in its application arises when language needs are not explicitly delineated based on practical usage. Such oversight can lead to student discontentment, as they may find themselves ill-equipped with the language skills demanded by their professional environments. Moreover, without a clear understanding of these needs, ESP teachers' efforts may become unfocused, potentially compromising the efficacy of the instruction and leaving students underprepared for real-world communication challenges (Axmedovna et al., 2019; Hu & AlSaqqaf, 2023; Lasekan et al., 2023). Another debate surrounding needs analysis extends to its role in fostering sustainable curriculum development. As the United Nations' Sustainable Development Goals (UN's SDGs) suggest, mainly through the fourth goal, there is a pressing need to ensure that quality education is sustainable (Saini et al., 2023). This entails an education system that not only meets current educational aims but also possesses the flexibility to evolve with the changing demands of society (Koçulu & Topçu, 2024; Cardiff et al., 2024).

For practitioners of ESP, this underscores the importance of continually refining business English programs. In assessing needs analysis, the framework proposed by Hutchinson and Waters (1987) offers an analytic approach to needs analysis in the context of ESP. It emphasizes a learning-centered perspective, which is crucial for tailoring instruction to the unique context of the learners. According to that framework, there are target needs and learning needs. Target needs are categorized into three distinct types: i) necessities; ii) lacks; and iii) wants. Learning needs focus on the processes and activities that learners require to bridge the gap between their current proficiency and the desired outcomes. It is justified that by distinguishing between target and learning needs, ESP practitioners can develop a more nuanced understanding of their students' profiles, leading to more targeted and effective teaching interventions (Paltridge et al., 2009).

While previous empirical studies (e.g. Trujeque-Moreno et al., 2021; Lasekan et al., 2023; Simaremare et al., 2023; Rimkeeratikul, 2022 & Suraprajit et al., 2024) have posited that needs analysis, following Hutchinson and Waters' (1987) approach through questionnaire-based data collection, can revitalize the sustainability of ESP courses. Notably, there is a scarcity of

studies that thoroughly examine speaking skills, a critical aspect of business English proficiency. Furthermore, most of these studies are conducted in contexts outside of China. This lack of research in China not only undermines the applicability of existing findings but also overlooks the unique needs and challenges of business English learners in this economically influential region.

Necessities of Using the Valid and Reliable Questionnaire in Language Research

Questionnaires have proven to be valuable tools in language research, enabling the use of quantitative methods to investigate the attitudes, perceptions, and behaviors of education stakeholders (Gu, 2016). However, the accuracy and reliability of such research hinges on the validity and reliability of the questionnaires themselves. Before drawing conclusions or undertaking further analysis, it is crucial to assess these factors (Gay et al., 2012; Cohen et al., 2018). This is particularly important in second language (L2) research where questionnaires are often used to measure abstract concepts such as learning needs. While some studies rely solely on previous reliability scores (Trujeque-Moreno et al., 2021; Lasekan et al., 2023), this practice is insufficient. A more rigorous approach, mirroring practices in other fields such as medical research, involves systematically testing the validity and reliability of measurement scales using statistical techniques such as exploratory (EFA) and confirmatory factor analysis (CFA) as well as reliability tests (Cronbach's α) (such as Park et al., 2017; Lee et al., 2014). This is vital for producing generalizable and trustworthy results, as using validated instruments is key to achieving these goals (Moreira et al., 2024).

To accurately assess learners' specific needs, especially in business English, using validated and reliable survey instruments is crucial (Kishore et al., 2021). Questionnaires emerge as a practical tool for capturing the objective needs of the intended audience, ensuring that the curriculum remains relevant and responsive (Dörnyei & Dewaele, 2023). However, research addressing the speaking needs analysis for business English remains scarce (Hu & AlSaqqa, 2023), despite a broader body of work on general speaking needs analysis (Yana, 2016; Ahmed et al., 2023). Given the increasing demand for effective communication in business contexts, it is essential to have a current questionnaire that can provide deeper insights into the speaking needs of business English learners at the higher education level. Recognizing the complex interplay of learner identities, including professional, gender, cultural, and institutional identities, which are significant to business English students (Zhang, 2013), the authors of this study developed a scale from relevant literature and validated it. The scale has been named the Oral Business English Needs (OBEN) Scale. This scale aims to assess the specific needs of Chinese business English undergraduates.

Methodology

Research Approach and Design

This study was conducted to develop and validate a scale designed to evaluate the needs of Chinese business undergraduates for OBE courses. It employed a quantitative method and a cross-sectional research design. The construction of the scale involved three main stages as recommended by Park et al. (2017). Stage I: Development of the Instrument, which involved generating items from existing literature. Stage II: Pilot Item Analysis, where the items were evaluated through EFA to assess their structure. Stage III: Psychometric Testing, in which CFA was conducted to validate the factor structure and ensure the instrument's reliability and validity. This process led to a valid and reliable instrument for needs analysis (Park et al., 2017; Kishore et al., 2021).

Research Instrument (Stage I: Development of the Instrument)

Initially, a literature search was conducted to gather existing scale items pertinent to a general needs analysis within ESP, forming the preliminary item set. Various digital database platforms, including Google Scholar and the Education Resources Information Center (ERIC), were employed with key search terms such as needs analysis, ESP, speaking, and business English. The selected literature included works by Dai and Liu (2016), Gravatt et al. (1997), Menggo et al. (2019), and Yana (2016). Based on Hutchinson and Waters' (1987) framework for needs analysis, a total of 27 initial items were created. Given the context of L2 research, the bilingual version of the questionnaire was given due consideration. Although the participants were undergraduates specializing in business English with a language proficiency equivalent to B1 in the Common European Framework of Reference for Languages (CEFR), their native language is Mandarin Chinese. To enhance the accuracy of data collection, a native language version should also be provided (Nascimento et al., 2024). This study used a Chinese version of the questionnaire, employing the back-translation method recommended by Dörnyei and Dewaele (2023). The current scale employed a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to measure respondents' perceptions. In addition, these items were all phrased positively to enhance comprehension and readability, considering individual differences in reading comprehension ability (Weem et al., 2006).

Additionally, to ensure the questionnaire's content validity, as Davis (1992) and Yusoff (2019) suggested, a minimum of two experts is considered acceptable. Three experts with Ph.D. degrees were consulted. These experts were selected for their specific knowledge and experience in teaching English language and instruction and curriculum development. They employed a form to measure the questionnaire's content validity on a three-point scale (1 = poor, 2 = average, 3 = good), evaluating the items based on their relevance and appropriateness (Taherdoost, 2016). These experts agreed on the pertinence and suitability of the items for this current context. Still, they removed one item that did not precisely represent the intended construct, thus refining the questionnaire to 26 items. Regarding face validity, three Chinese business English undergraduates, akin to the target participants, were invited to evaluate the questionnaire. All three confirmed that it was well-structured and clear, making it suitable for assessing students' needs.

Participants

Due to the research design, only Stage II (pilot testing) and Stage III (psychometric testing) involved Chinese business English undergraduates as participants. These participants were selected through simple random sampling using Microsoft Forms, which took approximately 10 minutes to complete. Further details are provided below.

Stage II Pilot Testing (EFA)

In Stage II of the pilot testing undertaking EFA, 52 Chinese business English undergraduates were selected to participate, including 46 females and six males. Many participants were 19–20 years old (55.8%) and 21–22 years old (44.2%). Almost all participants (98.1%) were in their third year of undergraduate studies. There were no participants who were 18 years old or younger, 23 years old or older, or in their first or fourth year of undergraduate studies. These participants were chosen because their baseline characteristics matched those of the participants who would be involved in Stage III of the study, where a CFA would take place. However, these pilot participants would not participate in the main study planned for Stage III to maintain the integrity of the study design and ensure the validity of the results (Gay et al., 2012).

Stage III Psychometric Testing (CFA)

In the actual study, which is Stage III, 396 business English undergraduates participated. With all these concerns, a total of 396 valid questionnaires were collected from undergraduate business English students across major parts of China, representing a diverse range of academic levels. The participants included 2 first-year students, 204 second-year students, 79 third-year students, and 111 fourth-year students. This diverse sample provides valuable insights into the perspectives of students at different stages of their business English studies. However, most of the respondents were female ($N = 363$), with only 33 male respondents participating in the survey. This imbalance in gender representation is a common occurrence in L2 research (Quint Oga-Baldwin & Fryer, 2020). Additionally, most respondents were aged 19–20 years old ($N = 206$), followed by 21–22 years old ($N = 143$). A smaller number of respondents were 23 years old and above ($N = 33$), and the least represented age group was 18 years old and below ($N = 14$).

Ethical Considerations

This study focused on investigating the speaking needs of business English undergraduates in China, which is designed to uphold ethical standards well. The study did not involve disclosing any personal information that could lead to the identification of individual participants, thereby posing no risks or ethical concerns. Participants were recruited on a volunteer basis for nearly two months. To ensure ethical compliance, participants were informed about the purpose of the study and assured of the anonymity of their responses. They were clearly informed that participation was entirely voluntary and that they could terminate the survey at any time without consequence. The participants were also aware that completing and submitting the survey was considered as an implicit consent for the use of their data in future research publications. All collected data was treated with strict confidentiality, securely stored, and accessible only to the research team. Data analysis and reporting were conducted to ensure individual participants could not be identified (Gay et al., 2012; Cohen et al., 2018).

Results and Discussion

This study comprises two distinct phases, each utilizing separate datasets. The first phase focused on conducting a pilot test to perform EFA, while the second phase involved collecting data for CFA and assessing the convergent and discriminant validity of the OBEN scale.

Pilot Item Analysis (Stage II)

This pilot study employs EFA as a crucial step in adapting the questionnaire for the main study. The EFA serves two primary purposes: first, to determine the underlying dimensions or factors represented by the questionnaire items, and second, to identify and eliminate items with low factor loadings and redundant items. This process ensures that only items with strong factor loadings and clear relevance to the intended dimensions are retained for the final questionnaire. Following the EFA, Cronbach's alpha reliability coefficient is calculated for the remaining items to assess their internal consistency and suitability for use in the field study.

Assumptions Testing

Before conducting factor analysis, this study subjected the entire OBEN scale ($N = 26$) to assumptions testing for missing data, outliers, and normality. To assess the presence of outliers, this study applied the z-score value and inspected items with values outside the range of $-3.0 < z < 3.0$ using SPSS 29 (Anusha et al., 2019). The results indicated no presence of outliers.

The skewness and kurtosis coefficients were also examined for all items to determine whether the normal distribution assumption was met. The skewness was .733, and the kurtosis was 1.517, both falling within the acceptance range of -1.96 to $+1.96$ (Kim, 2013), indicating normality in the dataset.

Exploratory Factor Analysis

The OBEN scale was distributed to 52 Chinese EFL English business undergraduates whose backgrounds were similar to those of the actual participants involved in the study. To identify factor loadings and their dimensions for the 26-item online questionnaire, EFA was conducted using SPSS 29, employing data collected from 52 undergraduate respondents. The pilot data underwent dimension reduction analysis using the principal component analysis (PCA) method for extraction and the Direct Oblimin method for rotation (Pallant, 2020).

In the first round of EFA, Bartlett's Test of Sphericity yielded a significant result ($p < .001$), indicating sufficient common variance in the intercorrelation matrix for EFA. The Kaiser-Meyer-Olkin (KMO) value was 0.637 (>0.6), suggesting the matrix had adequate sampling (Hair et al., 2018; Pallant, 2020). Using criteria such as eigenvalues greater than 1, factor loadings exceeding 0.4, and no cross-loading factors (Pallant, 2020), the initial EFA analysis was performed. However, the option to force the factors into five was applied to align the extracted factors with predetermined ones. Based on the pattern matrix, several cross-loading items were detected, having cross-values on more than two components. To address the cross-loadings observed in the pattern matrix, items S3 (I have trouble leading class discussion.), S5 (I have difficulty giving oral presentations.), S15 (I prefer to work individually when I am asked to perform a speaking task.), S19 (I think the teacher should work as a facilitator to guide the learning of students.), and S23 (I am satisfied with the teachers of business English major.) were removed from the dataset. This decision was based on a theoretical understanding of the constructs being measured and improved accuracy in the number of factors (Guvendir & Ozkan, 2022; Li et al., 2020).

After removing the five items, a second round of EFA was conducted by repeating the same procedures. Bartlett's Test of Sphericity ($p < .001$) and the KMO value of 0.673 (>0.6) supported the suitability of the analysis. The resulting five-factor structure explained 73.470% of the total variance, offering a more robust representation of the underlying constructs (Figure 1).

This resulting five-factor structure, comprising 21 items, demonstrated a satisfactory fit to the data (Kline, 2014). It is essential that the explanatory power of all factors exceeds 40% and that the explained variance surpasses the unexplained variance (Yıldız & Erkan, 2024).

Table 1 presents the factor loadings for all items and their respective constructs. The first component, "perceived course satisfaction" (PCS), was formed by items S20-S22 and S24-S26. The second component, "difficulties in oral communication" (DOC), was constituted by items S6-S9. Items S10-S13 formed the third component, "required speaking activities" (RSA). The fourth component, "oral challenges in collaborative engagement" (OCCE), comprised items S1, S2, and S4. Finally, the fifth component, "perceived learning styles" (PLS), included items S14 and S16-S18. Moreover, it illustrates the final five-factor structure from EFA, including definitions of the subscales, sample items, the three learning needs subscales, and the two target needs subscales. The factor loadings for the five components ranged as follows: PCS (0.657 to 0.946), DOC (0.858 to 0.946), RSA (0.768 to 0.916), OCCE (0.695 to 0.927), and PLS (0.575 to 0.772). Furthermore, the normality of each construct yielded favorable results, falling within the range of -1.96 to $+1.96$ (Kim, 2013), suggesting that the data for each construct was normally distributed.

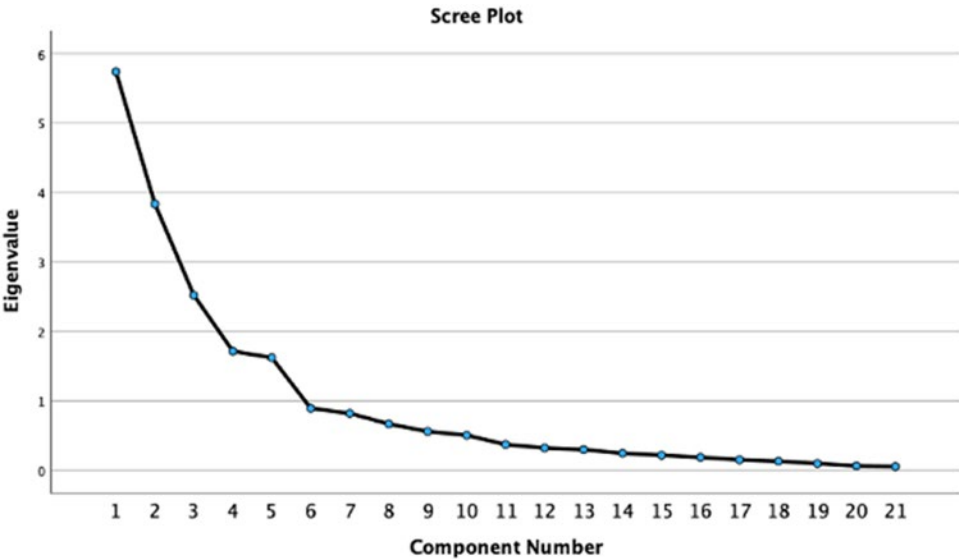


Figure 1 Screen plot of the OBEN Scale in EFA.

Cronbach’s coefficients were then calculated to ensure the instrument’s internal reliability. Using a cut-off point of 0.7 (Chua, 2024), the instrument demonstrated an overall internal reliability coefficient of 0.764 (see Table 2).

The reliability for these five constructs was satisfactory, ranging from 0.721 to 0.938, as indicated in the following Table 4. Based on the retained constructs, PCS had a reliability of 0.901, DOC had a reliability of 0.938, RSA had a reliability of 0.874, OCCE had a reliability of 0.833, and PLS had a reliability of 0.721. The EFA revealed five distinct underlying constructs within the OBEN scale, each subscale consisting of more than three items exhibiting acceptable factor loadings and demonstrating good internal consistency. To further validate these extracted factors, CFA was conducted using a separate dataset in the subsequent section, assessing the goodness-of-fit of the proposed model.

Psychometric Testing (Stage III: Confirmatory Factor Analysis)

In the second phase of the administration, a separate sample was used to perform CFA on the structural model of the OBEN scale to validate its construct validity. The data underwent a similar data-screening process, confirming that the data were normally distributed, with a skewness value of .118 and a kurtosis value of .089 (Chua, 2024; Kim, 2013).

Goodness of Fit of the CFA Model for the OBEN Scale

To evaluate the goodness-of-fit of the five-factor structure identified through the initial EFA, this phase employed CFA using CB-SEM in SmartPLS4 within the reflective model (Chua, 2024; Ringle et al., 2024). This analysis was conducted on a separate sample size of 396 participants, distinct from those involved in the EFA (Chua, 2024; Tekel et al., 2024; Kos & Celik, 2023), aiming to examine the latent variable structure of the OBEN scale in a new context. Multiple fit indices were used to examine the adequacy of the model fit to the data, including the ChiSqr/df, Tucker Lewis Index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA).

Table 1 Factor loadings of pattern component matrix for undergraduates (N = 52).

Pattern matrix ^a	Component					New code
	1	2	3	4	5	
S25	0.946					PCS1
S26	0.889					PCS2
S22	0.811					PCS3
S24	0.790					PCS4
S21	0.781					PCS5
S20	0.657					PCS6
S7		0.946				DOC1
S9		0.936				DOC2
S6		0.860				DOC3
S8		0.858				DOC4
S11			0.916			RSA1
S12			0.876			RSA2
S10			0.794			RSA3
S13			0.768			RSA4
S2				0.927		OCCE1
S1				0.862		OCCE2
S4				0.695		OCCE3
S17					0.772	PLS1
S16					0.752	PLS2
S14					0.717	PLS3
S18					0.575	PLS4
Skewness	-.542	-.020	.104	.316	.345	
Kurtosis	1.297	.221	-.190	-.444	-.124	
Eigenvalues	5.741	3.835	2.519	1.713	1.620	
Explained variance (%)	27.340	18.260	11.995	8.159	7.715	
Cumulative variance (%)	27.340	45.600	57.595	65.755	73.470	

Note: Extraction method: principal component analysis. rotation method: Oblimin with Kaiser Normalization;
a. Rotation converged in 10 iterations. Perceived Course Satisfaction (PCS), Difficulties in Oral Communication (DOC), Required Speaking Activities (RSA), Oral Challenges in Collaborative Engagement (OCCE), Perceived Learning Styles (PLS).

Along with an inspection of model fit, construct validity and reliability, discriminant validity (using the Fornell-Larcker criterion and Heterotrait-monotrait ratio (HTMT)), and standardized factor loadings in the structural model of the OBEN scale. In this study, the CFA results (as seen in Table 3) indicate that the model fit indices are acceptable (ChiSqr/df = 2.813, p = .00, RMSEA = 0.068), albeit tolerably the good fit values (TLI = 0.905, CFI = 0.919). These results

Table 2 Reliability analysis of the OBEN scale (pilot study).

Construct	Number of items	Cronbach’s alpha (>0.7)
PCS (S20, 21, 22, 24, 25, 26)	6	0.901
DOC (S6, 7, 8, 9)	4	0.938
RSA (S10, 11, 12, 13)	4	0.874
OCCE (S1, 2, 4)	3	0.833
PLS (S14, 16, 17, 18)	4	0.721
Total OBEN scale	21	0.764

Note: Perceived Course Satisfaction (PCS), Difficulties in Oral Communication (DOC), Required Speaking Activities (RSA), Oral Challenges in Collaborative Engagement (OCCE), Perceived Learning Styles (PLS).

Table 3 Goodness-of-fit indexes for five-factor model using CFA (estimated model).

ChiSqr/df	RMSEA	TLI	CFI
2.813	0.068	0.905	0.919

are in line with previous research by Kim et al. (2016) and Akkuş (2019), Kos and Celik (2023), demonstrating that these measurement tools are reliable and valid to measure the intended concepts decently and can be effectively applied in practice. This is confirmed by the RMSEA fit index value, which should ideally be ≤ 0.08 , accompanied by a ChiSqr/df value of 3 (or even up to 5) (Chua, 2024; Dash & Paul, 2021). Fit indices such as the GFI show the bias with high degrees of freedom relative to sample size (Sharma et al., 2005). Its sensitivity has led some to recommend against its use (Hooper et al., 2008; Sharma et al., 2005). When inspecting discrepancy arises from indicators of poor fit, such as low factor loadings (<0.4) and inadequate theoretical alignment with factors (Kim et al., 2016). However, the study recommends not removing any items from the dataset with all factor loadings exceeding a cut-off point of 0.4 (Chua, 2024).

Validity and Reliability

The Average Variance Extracted (AVE) and composite reliability were evaluated regarding the construct validity and reliability. The AVE values for DOC (0.684), OCCE (0.549), PCS (0.557), PLS (0.525), and RSA (0.540) all exceed the 0.5 threshold, with composite reliability scores of 0.893, 0.785, 0.882, 0.816, and 0.815, respectively (all above 0.7), confirming construct validity and reliability (Table 4).

Furthermore, the Fornell-Larcker criterion and HTMT were applied to assess discriminant validity (Table 5). This criterion requires that AVE for each latent variable exceeds the correlation coefficient with any other latent variable. As shown in Table 5, the Fornell-Larcker criterion for the five latent factors (0.827, 0.741, 0.746, 0.725, and 0.735) exceeded the inter-construct correlations, indicating sufficient discriminant validity (Chua, 2024). Additionally, HTMT values below 0.90 further confirmed the establishment of discriminant validity.

Table 4 Construct reliability and validity of the OBEN scale.

	Cronbach's alpha (standardized)	Cronbach's alpha (unstandardized)	Composite reliability (rho_c)	Average variance extracted (AVE)
DOC	0.894	0.892	0.893	0.684
OCCE	0.784	0.784	0.785	0.549
PCS	0.883	0.882	0.882	0.557
PLS	0.815	0.815	0.816	0.525
RSA	0.823	0.818	0.815	0.540

Note: Difficulties in Oral Communication (DOC), Oral Challenges in Collaborative Engagement (OCCE), Perceived Course Satisfaction (PCS), Perceived Learning Styles (PLS), Required Speaking Activities (RSA).

Table 5 Discriminant validity (Fornell-Larcker criterion) of the OBEN scale.

	Fornell-Larcker criterion					HTMT				
	DOC	OCCE	PCS	PLS	RSA	DOC	OCCE	PCS	PLS	RSA
DOC	0.827									
OCCE	0.553	0.741				0.576				
PCS	0.047	−0.154	0.746			0.055	0.156			
PLS	0.195	0.060	0.398	0.725		0.212	0.112	0.400		
RSA	0.199	−0.049	0.469	0.303	0.735	0.207	0.109	0.469	0.292	

Note: Difficulties in Oral Communication (DOC), Oral Challenges in Collaborative Engagement (OCCE), Perceived Course Satisfaction (PCS), Perceived Learning Styles (PLS), Required Speaking Activities (RSA).

Therefore, the CFA model yielded 21 items related to the five factors. These items can be further divided into three measuring constructs for target needs: ‘OCCE’ (3 items; factor loadings: 0.731–0.751), ‘DOC’ (4 items; factor loadings: 0.748–0.893), and ‘RSA’ (4 items; factor loadings: 0.643–0.836). Additionally, there are two measuring constructs for learning needs: ‘PLS’ (4 items; factor loadings: 0.713–0.741) and ‘PCS’ (6 items; factor loadings: 0.708–0.771). All p-values are at significant levels. Figure 2 illustrates the CFA model of the OBEN scale. Moreover, the finalized OBEN scale, with a reduced number of items (N = 21) in the questionnaire, aims to improve response rates compared to the initially constructed version with 26 items (Goodwin et al., 2020).

A 5-point Likert measurement tool with the options numbered as 1, 2, 3, 4, and 5 starting from 1 were scored as “strongly agree” 5 points, “agree” 4 points, “neutral” 3 points, “disagree” 2 points, “strongly disagree” 1 point. The minimum possible score on this scale is 21 (if all responses are “strongly disagree”), and the maximum score is 105 (if all responses are “strongly agree”). In most cases in this OBEN scale, low scores highlight aspects where participants

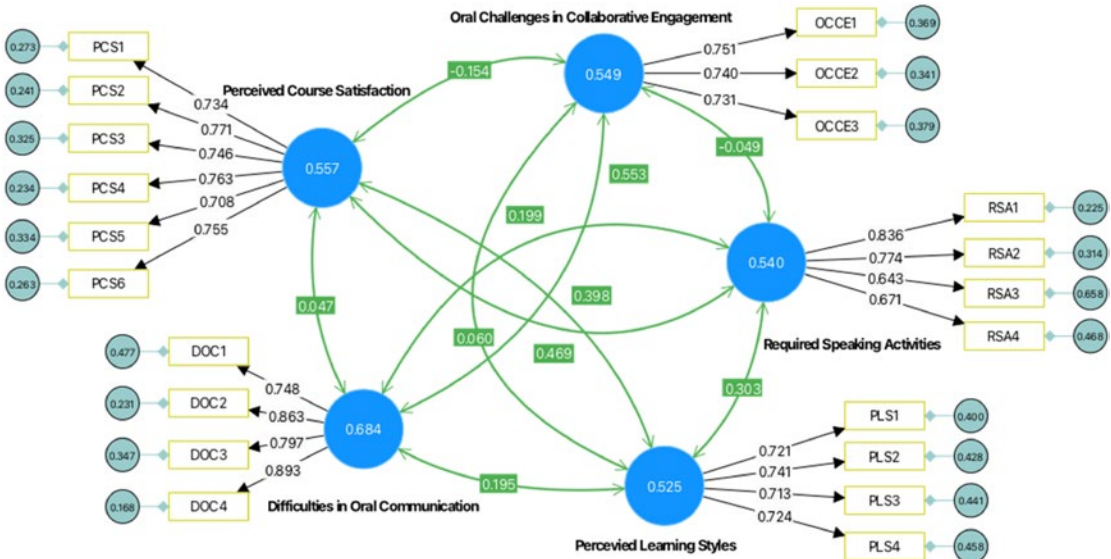


Figure 2. Structural model of OBEN scale.

perceive unmet needs or dissatisfaction. These areas require attention and potential adjustments, while high scores suggest areas where needs are well met. For example, an item from the construct PLS1, “I prefer to use digital literacy (e.g. information, media, ICTs) to enhance my speaking skills.”, reflects the participant’s attitude toward using digital literacy tools for improving their speaking skills. A high score (4 or 5) suggests that the participant values digital literacy in language learning, while a low score (1 or 2) might indicate a lack of interest or preference for other methods. Integrating digital literacy, particularly AI-driven language teaching, into education is a hot topic in the educational domain (Qiao & Zhao, 2023). Furthermore, the level of digital literacy itself is increasingly considered, as it is an evolving process that requires ongoing attention and adaptation. This could impact the lesson preparation for future ESP curriculum development.

When it comes to the scope of Chinese business English undergraduates’ learning needs within the context of OBE instruction, the OBEN scale presented here provides a more comprehensive coverage compared to previous literature, such as that of Trujeque-Moreno et al. (2021). The current scale considers the aspects of ESP teaching and needs analysis and devotes full attention to speaking skills in business English. Hu and AlSaqqaf (2023) highlight the need for more focused needs analysis to ensure the sustainable effectiveness of ESP, particularly business English, in delivering high-quality education. Despite its contributions, general needs analysis has limitations in capturing the specific needs of language skills, leading to calls for more in-depth investigations (Dörnyei & Dewaele, 2023). Developing instruments tailored to specific skills is crucial to understand how needs analysis impacts curriculum development and student performance. This study, however, proposes a new approach to instrument validation using EFA and CFA, aiming to provide a framework for future research in this area, can follow this framework when developing and validating their own measurement instruments. Researchers can follow this framework when developing and validating their own measurement instruments. ESP programs are particularly prevalent in Chinese higher education, highlighting the importance of context-specific needs analysis.

The validation results of this study demonstrate the reliability and acceptability of the instrument for similar contexts. Pitura (2023) affirms that a validated questionnaire serves as an outstanding foundation for linguistic research aimed at uncovering the diverse viewpoints of stakeholders regarding their experiences and interpretations of linguistic phenomena. In essence, this case could facilitate the creation of more effective and efficient language curricula and instructional development that are specifically tailored to meet the unique demands of the business aspect of ESP teaching. Moreover, to ensure global accessibility and facilitate wider understanding of OBE, the instrument has been made available on Microsoft Forms, addressing limitations with Google Forms in certain regions. This sharing initiative, driven by requests from prospective researchers, aims to promote research replication and advance the field of L2 research (Marsden et al., 2018).

Conclusion

The authors of this study developed a bilingual scale, known as the OBEN scale, based on relevant literature (Dai & Liu, 2016; Gravatt et al., 1997; Menggo et al., 2019; Yana, 2016), to assess the needs of Chinese business English undergraduates in their OBE instruction. The adaptation of the questionnaire followed a rigorous methodology, including a thorough literature review, content and face validity assessments based on a focus group of experts and prospective participants.

Under the methodology specified, the validation process of the instrument began with an EFA conducted among a group of 52 participants. This initial phase was designed to explore the underlying structure of the data. A CFA was then performed with a larger sample of 396 participants to strengthen the validity further. The purpose of the CFA was to confirm the structural integrity of the scale, ensuring that it aligns with the theoretical model. The synthesis of the EFA and CFA outcomes culminated in the refinement of a five-factor questionnaire consisting of 21 items. They are (i) perceived course satisfaction, (ii) difficulties in oral communication, (iii) required speaking activities, (iv) oral challenges in collaborative engagement, and (v) perceived learning styles. These components collectively address the oral proficiency needs of undergraduate students majoring in business English. Moreover, the study demonstrated that the goodness-of-fit indices of the models were reasonably satisfactory, aligning with the needs analysis framework proposed by Hutchinson and Waters (1987). This alignment is a significant strength of the study, as it provides a solid foundation for the instrument's application. This study not only ensures the reliability and effectiveness of the instrument but also positions it as a valuable resource for enhancing the oral proficiency of business English undergraduates. It provides a clear direction for curriculum development, instruction, and assessment, ultimately contributing to the overall quality of business English education.

The above being said, this study has several limitations. The data was collected through online platforms, relying on self-reported measures. This could lead to exaggerated responses, reluctance to disclose private details, and potential bias. Additionally, the study's participant demographics present a limitation, with a notably high proportion of females, a common characteristic in L2 research. Despite these limitations, future studies should prioritize longitudinal research designs that incorporate diverse sampling techniques, such as purposive sampling. This approach is essential for the involvement of a wide range of stakeholders. These studies should aim to deeply analyze the context by tracking their perceptions and experiences with OBE instruction over time. Furthermore, the validation process should include more subscales that account for other relevant constructs from needs-analysis theories to understand the interplay among various variables better.

In addition to these aspects, the study offers implications for business English teaching. Promoting well-being and ensuring customized, relevant content is crucial. Integrating the UN's SDGs is essential, emphasizing sustainable development and equality in education. Furthermore, the developed five-structured scale can provide valuable information for designing educational programs or training interventions to improve the quality of language education, particularly in ESP. This scale sheds light on the concerns regarding sustainable development in ELT within ESP and can be adapted for use in different countries and institutions with further modifications.

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Appendix

Appendix A: Oral Business English Needs (OBEN) Scale

English version		Chinese version
<i>Perceived Course Satisfaction (PCS)</i>		
PCS1	I think the current textbooks used in my class are at the appropriate level of difficulty for further developing my speaking skills.	我认为目前我们课堂上使用的教材难度适中，有助于进一步提高我的口语能力。
PCS2	To some extent, the business English textbook to further develop my speaking skills is appropriate for me to use (e.g. systematicity, practicality, and matching with students' needs).	在某种程度上，商务英语教材对于进一步发展我的口语技能是适合我使用的（例如，系统性、实用性以及与学生需求的匹配度）。
PCS3	I am satisfied with the techniques used to further develop my speaking skills.	我对用于进一步提高我的口语技能的方法感到满意。
PCS4	I think the current instructional materials are suitable for my career development.	我认为目前的教学材料适合我的职业发展。
PCS5	I am satisfied with my business English course, especially the speaking-focused component.	我对我的商务英语课程很满意，尤其是侧重于口语的部分。
PCS6	Overall, I am satisfied with the business-English course that I am taking.	总体来说，我对正在参加的商务英语课程感到满意。
<i>Difficulties in Oral Communication (DOC)</i>		
DOC1	I worry about saying something in case I make a mistake in English.	我担心说错话，因为我可能会在英语中犯错误。
DOC2	I do not know the best way to say something in English.	我不知道用英语表达某件事情的最佳方式。
DOC3	I have trouble wording what I want to say quickly enough.	我在措辞时速度不够快，难以表达我想说的内容。
DOC4	I do not know how to say something in English.	我不知道如何用英语表达某件事情。
<i>Required Speaking Activities (RSA)</i>		
RSA1	Participating effectively in discussions	有效参与讨论。
RSA2	Communicating effectively with peers in small group discussions, collaborative projects, or out-of-class study groups.	在小组讨论、协作项目或课外学习小组中有效地与同伴沟通。
RSA3	Giving formal speeches or oral presentations.	进行正式演讲或口头报告。

Continued

Continuation

	English version	Chinese version
RSA4	Simulating role plays in particular scenarios (e.g. talking with clients, answering clients' calls, etc.).	在特定场景下进行角色扮演模拟（例如与客户交谈、接听客户电话等）。
<i>Oral Challenges in Collaborative Engagement (OCCE)</i>		
OCCE1	I have difficulty working with other students on out-of-class projects.	我在与其他学生合作完成课外项目时遇到困难。
OCCE2	I have difficulty working in small groups during class.	我在课堂上进行小组活动时遇到困难。
OCCE3	I have difficulty participating in large group discussions.	我在参加大组讨论时感到困难。
<i>Perceived Learning Styles (PLS)</i>		
PLS1	I prefer to use digital literacy (e.g. information, media, ICTs) to enhance my speaking skills.	我更倾向于使用数字素养（如信息、媒体、信息通信技术）来提高我的口语技能。
PLS2	I prefer to work with the whole class when I am asked to perform a speaking task.	当被要求进行口语任务时，我更喜欢与全班一起合作。
PLS3	I prefer to work collaboratively (in groups or pairs) when I am asked to perform a speaking task.	当被要求进行口语任务时，我更喜欢以合作的方式进行（小组或配对）。
PLS4	I think teachers should take a traditional role and control everything in class.	我认为教师应该扮演传统角色，控制课堂上的一切。