

Research Article

A Content Analysis of Exploring Trends and Dynamics of English Language Pedagogy in Engineering Departments

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Article Info	Abstract
Article History	English language pedagogy has shifted from a broad to a specialized pattern in the past several decades. The aim of the present study is to examine the pedagogical landscape of the English language in engineering departments. The study demonstrates a remarkable prevalence of authors, focusing on the significance of independent investigation in the field by assessing various aspects such as authorship, years of publication, involvement of the countries where the studies were conducted, and the methodologies employed in the studies. A temporal analysis reveals an emphasis on studies during 2020-2022, suggesting increased concern and responsiveness to specific issues in English pedagogy in engineering departments. In terms of countries, Indonesia, China, and Malaysia emerge as substantial contributors, highlighting their dynamic involvement in English language instruction in engineering departments. Qualitative methodologies dominate, acknowledging the nuanced nature of language teaching in engineering and enabling a profound exploration of instructional intricacies. In summary, this content analysis provides insights into the distribution, trends, and preferences in teaching English in engineering fields. The prevalence of individual authorship, temporal clustering, geographical concentrations, and the dominance of qualitative methods collectively enrich the understanding of this dynamic research landscape.
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1. Introduction

English language instruction has moved from broad to specialized paradigms in the last few decades. No specific course was offered that concentrated on developing English communication skills because English language instruction was seen as a social activity (Ellis, 2012; Shi, 2017) and students were forced to study the language's fundamentals for social reasons (Harmer & Khan, 1991). As a result, most colleges and universities in areas where English was not the predominant language of communication were less concerned with their students' English language proficiency. Therefore, there was no course subject specificity in the general English language classes offered in these places (Ur, 2012).

English language skills have become increasingly important in engineering disciplines in an era of rapid technological advancement and worldwide connectivity (Porcaro, 2013). While technical proficiency,

mathematical aptitude, and problem-solving skills have historically been associated with engineering education, the changing engineering landscape now demands professionals who can effectively communicate complex ideas, work across diverse teams, and negotiate the complexities of global discourse (Othman et al., 2022; Rus, 2020).

The strategies of teaching English language are thought to have an outstanding role in learning language by the students (Othman et al., 2022; Oxford, 2018). It is necessary to note that language teachers use impressive techniques and strategies to address the needs of the learners through implementing language learning and upbringing the level and quality of the students (Hardan, 2013; Lestari & Wahyudin, 2020; Mandasari & Oktaviani, 2018). The main purpose of using different strategies is to ease the learning process for the students and aid them to enhance their language learning journey effectively (Patil & Karekatti, 2012; Phusum & Sucaromana, 2020).

The current study conducts an in-depth investigation of all the aspects involved in incorporating English language instruction within engineering departments in terms of the number of researchers, year of publications, countries where the studies were conducted, and the methodologies were utilized. The opportunities and difficulties of incorporating English language instruction into engineering courses are discussed, emphasizing the potential revolutionary effect it can have on the overall development of engineering students. Integrating English language instruction in engineering departments fosters global competency and well-rounded engineers by nurturing cross-cultural collaboration and improving technical documentation and presentation skills.

The complexities of the advantageous relationship between language and engineering are examined. The importance of English instruction in engineering departments is examined, and efforts are made to investigate how it may help create a new generation of capable, articulate engineers ready to thrive in our increasingly interconnected global society.

The main objective of the study is to collect and carefully examine research publications published between 2016 and 2023 that especially address the use of the English language in engineering departments. The researcher has developed insightful research inquiries to identify and clarify the exact goals of this investigation. This research intends to provide a significant understanding of the changing role and influence of English language usage in the dynamic setting of engineering education and practice by combining various viewpoints and findings from the specified time range. This study aims to answer the following questions:

1. In what way have studies on English instruction in engineering departments been distributed based on the number of authors?
2. In what ways have research on English instruction in engineering departments been published according to the years of their dissemination?

3. In what ways have research on English instruction in engineering departments been dispersed throughout the nations where the studies were carried out?
4. How have research approaches been applied to the distribution of studies on English instruction in engineering departments?

2. Literature Review

2.1. English for Specific Purposes

English as a second or foreign language is subdivided into English for special purposes (ESP). It typically refers to imparting English language proficiency to college students or working adults, taking into account the specific vocabulary and abilities they require (Abakulovna, 2022). English for Specific Purposes (ESP) instruction aims to provide learners with the necessary language skills for a certain context, often known as target needs. English language learning is one of the important prerequisites for studying other disciplines (Othman et al., 2022). Since it began offering instructional objectives, resources, and procedures based on students' needs and future interests in the early 1960s, English as a foreign language (ESP) has become one of the most well-known subfields in language learning (Alblawi et al., 2017). English is now a required language for all academic disciplines, including business, science, engineering, and technology. Thus, fluency in the English language is no longer a choice but rather a competency required of students pursuing certain fields of study (Potter & Louati, 2016).

2.2. Architecture and English Instruction

For architects, proficiency in English is essential since it facilitates efficient communication and documentation. To comprehend their demands and effectively explain their ideas, architects must be able to interact with clients, associates, and other professionals (Murtiningsih & Amelia, 2023). According to Poonpon (2011), developing the ability to lead class discussions and lectures, evaluating homework and projects, and communicating effectively are the characteristics of teaching English to engineering students. Before graduating, international and ELL graduates often achieve a proficient level of English (i.e., an overall score of 6.0 in the international English language testing system; IELTS). But in the workplace, where professional interactions are rare, engineering graduates typically lack interpersonal and verbal communication abilities (Santos, 2019).

2.3. Trends in English Language Instruction in Engineering Departments

The importance of communication in the working environments of engineers in practice is only increasing. Given this, the majority of undergraduate engineering courses charge for written and spoken communication (Keane & Gibson, 1999). The impact of technology on ESP course instruction is one of the

many trends that cannot be understated. Teachers have not yet been displaced by technology, and this is unlikely to happen very soon. But as the trend continues, it is becoming more and more obvious that teachers who use technology will eventually replace those who do not, and for good reason (Pazoki & Alemi, 2020). Every element of human existence has been transformed by the internet, and the educational system is starting to feel more and more the effects of this transformation. It's fascinating to read about how mobile application development, social media, and the internet have affected ESP teaching and learning (Khan, 2019; Shareef et al., 2024).

3. Materials and Methods

3.1. Methods

The current study employs mixed content analysis to examine research articles concerning investigating the dynamics and trends of English language teaching in engineering departments. A research method called mixed content analysis seeks to draw reliable conclusions about the concepts being employed from texts and documents (Ahmed, 2023; Bicen & Demir, 2020). Furthermore, a research methodology integrating qualitative and quantitative content analysis techniques to systematically examine and interpret textual, visual, or audio data (Creamer & Ghoston, 2013). To further define mixed content analysis, this approach combines the depth of qualitative analysis, involving identifying themes and patterns through coding and categorization, with the precision of quantitative analysis, which entails the systematic counting or categorizing specific elements within the data. With the adoption of a mixed-methods research design, the researcher seeks to thoroughly comprehend the research questions using the merits of both quantitative and qualitative approaches. Moreover, the study addresses descriptions and interpretations related to research on English language pedagogy in engineering departments (Borrego et al., 2009; Creamer, 2017).

3.2. Sample

This thorough research investigated thirty research articles published from 2016 to 2023 to offer insight into the state of English pedagogy in engineering departments. The reason for choosing these years, according to the best knowledge of the researcher is particularly related to the relevancy to the topic or issue that are selected for investigation. For example, these years would represent a significant advancement in features and capacity growth for studying the evolution of a specific technique in teaching methods in engineering department. Furthermore, another reason for selecting these years might be due to the practical considerations of the studies, such as project duration matching, resource availability, or database or research interoperability.

These articles were carefully selected to offer a sophisticated comprehension of the changing approaches and trends in the area throughout this particular period. The current study went beyond considering their pertinence to investigate the complexities of English teaching in engineering departments. In order to better understand the vast array of study topics, the researcher conducted in-depth analyses of characteristics such as author counts, publication dates, nation origins, and research procedures.

3.3. Data Collection and Analysis Procedure

The related data for the study were collected, arranged, and then analyzed and interpreted using descriptive statistical analysis. The data were then computed as percentages based on the frequencies. Tables were constructed to illustrate the themes related to each research issue. There are four tables presenting four different topics, which were selected based on the number of authors, the year of publication, the countries in which the studies were conducted, and the methodology of the studies.

This research attempted to reveal the dynamic character of teaching methods and approaches by investigating interdisciplinary viewpoints and looking for trends in publishing timelines. In order to identify possible cultural impacts, we considered regional differences, and a thorough analysis of methods gave us insight into the various strategies used in these academic publications. Nuanced conclusions about the complex field of English instruction in engineering departments are based on this intensive investigation.

3.4. Scanning criteria

The research articles were searched using the Boolean operators through the keywords “teaching English in engineering,” “engineering and English language,” and “English language and Architecture”. The selection of keywords is motivated by the desire to thoroughly investigate the changing landscape of English language instruction in academic literature. These chosen keywords are considered representative because of their hierarchical structure, starting from the broader concept of engineering and English language and progressing to its application in English language and architecture. This progression allows for a detailed analysis. However, it is recognized that relying solely on these keywords may unintentionally exclude relevant articles that do not explicitly use this terminology. Some studies were excluded from the study; however, they had similar keywords, but the content was different.

The decision to concentrate on 2016-2023 is strategic, aiming to capture the most recent developments and trends in the field. However, this temporal constraint may also limit the inclusion of valuable earlier contributions. Additional search strategies and alternative terms will be explored to address these potential limitations to ensure a more comprehensive and refined exploration of the subject matter.

The decision to gather data from the Google Scholar database was primarily driven by its accessibility and the availability of a diverse range of research articles. Google Scholar is a user-friendly and widely

accessible platform, making it convenient for researchers to conduct thorough literature reviews. Its extensive coverage spans academic papers, theses, conference proceedings, and scholarly articles from various disciplines.

4. Result and Discussion

4.1.. Dissemination Patterns Based on Authorship

This part demonstrates a detailed investigation of the authors' patterns, suggesting insightful information that elucidates the complexities of contributor positions and how they influence research status. The trend of authorship demonstrates a remarkable understanding of collaboration dynamics, including the frequency of individual author versus multi-author works, the prevalence of international and interdepartmental partnerships, and the pervasiveness of specific institutions or countries in the field. The overall authorship patterns not only demonstrate demographic regions but also highlight areas for prospective development in fostering more comprehensive and extensive research practices.

Table 1. Distribution of studies related to the number of authors.

Author	No.	Percentage
1	15	50%
2	10	33%
3	3	10%
4+	2	7%
Total	30	100%

Table 1 thoroughly examines author participation in a collection of studies, revealing patterns in the distribution of authorship within the research domain. The data is classified based on the number of authors per study, uncovering trends in collaborative research. The table breaks down studies according to author count, featuring four distinct categories: studies led by a single author (1), those with two authors (2), studies involving three authors (3), and those with plus four authors (4+). Corresponding numerical representations and percentage distributions are provided for each category. Half of the studies, constituting 50% of the total, were led by an individual author, indicating a significant presence of individual researchers contributing to the analyzed field's knowledge. Following closely, studies with two authors make up 33% of the total, signifying a substantial degree of collaboration between pairs of researchers.

Furthermore, the data demonstrates that research studies conducted by three authors comprise 10% of the total, suggesting an average level of three-way cooperation. Despite the fact that research involving four or more authors still contributes to the overall landscape, accounting for 7% of the total studies. In

conclusion, the analysis of authorship dissemination contributes invaluable understanding to group collaboration within the field, focusing on the prevalence of individual and teamwork research efforts in conducting studies.

It can be inferred that in English pedagogy in engineering departments, researchers might choose to conduct research independently for different purposes. Firstly, seeking individual authorship provides a sense of autonomy and resilience, allowing researchers to explore specific perspectives on the subject that align closely with their personal interests and expertise. Moreover, it entitles a more focused and competent approach, assisting an intensive investigation without collaborating with other researchers.

Additionally, projects conducted by individual authors often result in quicker and more advanced reactions and decision-making processes to integrate issues and trends in the field. The popularity of individual authors employing research, as perceived in the 30 research articles of the content analysis project, proposes the priority for individualized investigation for academic independence in the field of study. This tendency might also emulate the ethos of the architecture or engineering world, which tends to concentrate on individualism in the design of the work and the concept of the works.

4.2. Publication Timeline Analysis

This part illustrates a detailed analysis of the timeline of the publications, offering insight and stimulating discussions that highlight the improvement of trends and dynamics in the area of English language pedagogy and engineering departments. By assessing the consecutive distribution of research studies, the researcher recognized the time of publishing the highest rate of studies. This sequential analysis shows several factors that influence these patterns, such as shifts in technology advancements, educational policies, and changes in research funding.

Table 2. Years of the publications of the studies

Year	No.	Percentage
2016	5	17%
2018	5	17%
2019	2	7%
2020	6	20%
2021	2	7%
2022	8	27%
2023	2	7%
Total	30	100%

Table 2 demonstrates the sequential breakdown of the research articles conducted over the seven years, providing a comprehensive view of the temporal dissemination in the analyzed data. The dataset is

organized by the respective years of study, showing the percentage of the total for each year, as well as the numerical representation.

During these two years of temporal distribution, 2016 and 2018, research results remained consistent, with 5 studies conducted, accounting for 17% of the total studies for each respective year. The subsequent years, 2019 and 2021, saw a decrease in the production of research articles, with 2 research articles published each year, representing 7% of the total for each year. The year 2020, with the second highest rate of research articles, witnessed a significant amount of research activity, presenting 6 studies and comprising 20% of the overall research. In 2022, research activity reached its peak, with 8 studies published, accounting for 27% of the total studies. In 2023, there was a noticeable decline in research production, mirroring the levels seen in 2019 and 2021, representing 7% of the studies. This analysis of temporal dispersion provides valuable insights into the variations in research article production and publication over the seven-year period chosen for this study, offering a nuanced understanding of the shifts over time.

A growth in research activities in the area of English pedagogy in engineering departments during the years 2020 and 2022 could possibly be attributed to some reasons. Firstly, the global event of Covid-19 in 2022 could have inspired researchers to explore the impact of these unparalleled situations on language teaching in engineering departments. Secondly, technological advancements during this period could have sparked curiosity in research production for incorporating English language and pedagogy in engineering fields. Modifications in educational policies, funding availability, or new challenges could also have impacted researchers, leading to increased studies during these particular years.

4.3. Geographical Distribution Analysis

This part illustrates the geographical dissemination of research publications in English instruction in the departments of engineering through mapping technique to determine the differences and trends in different countries. Through depicting the spread of research production worldwide, it could be identified which country has a high rate of conducting research articles in the field. This investigation determines the differences in educational practices and multitude of outlooks in various cultures which impacted conducting these studies.

Table 3. Countries where the Studies were Conducted.

Country	No.	Percentage
China	4	13%
India	2	6%
Indonesia	6	20%
Iran	2	6%
Malaysia	4	13%

Oman	2	6%
Russia	3	10%
United Arab Emirates	2	10%
USA	2	6%
Uzbekistan	3	10%
Total	30	100%

Table 3 demonstrates a complete analysis of the geographic distribution of studies within a dataset, accentuating the involvement of diverse countries in shaping the research landscape. The data is organized by country, presenting the respective number of studies conducted and the percentage of the total, providing a nuanced perspective on global research engagement.

Leading in research contributions, Indonesia presents 6 studies, constituting 20% of the total. Malaysia and Uzbekistan, contributing 4 and 3 studies, respectively, demonstrate noteworthy research activity, comprising 13% and 10% of the overall dataset, respectively. Russia also plays a significant role with 3 studies, accounting for 10% of the total. Several countries, such as China, Iran, Oman, the United Arab Emirates, and the USA, each contribute 2 studies, with percentages ranging from 6% to 13%, showcasing a diverse and distributed representation of research efforts. In summary, the analysis of geographic distribution underscores the global nature of research within the dataset, emphasizing the active participation of numerous countries. The percentages offer a relative measure of each country's contribution, providing insights into the collaborative and diverse nature of the research landscape within the specified scope.

A few elements come together to explain the overwhelming number of research papers from nations like China, Indonesia, and Malaysia on applying the English language in engineering. The higher education systems of these countries have grown significantly, with greater funding going toward engineering and language instruction. By actively promoting internationalization within their academic institutions, these nations have emerged as centers of study, bringing their teaching methods into compliance with international norms. Furthermore, scholars investigating the use of English in engineering face particular opportunities and challenges due to these nations' vast linguistic and cultural variety.

A high density of research studies in China, Indonesia, and Malaysia is facilitated by academic collaboration among research centers and educational institutions, driven by the adoption of new technology and trends. Sophisticated investigations of the paradigm that has been observed require an understanding of the exceptional instructional contexts and circumstantial aspects in each country.

4.4. Methodological Analysis Insights

This section illustrates the distribution of details regarding the research methodology employed in the instruction of English language in engineering departments. The researcher examined a wide range of methodological designs in the context of the study. By analyzing various methods, including qualitative, quantitative, and mixed method studies, this part establishes the impact of the methodological designs and their limitations. The analysis also examines the categorization of commonly used research designs.

In the search for upgrading competence, researchers conduct various methodological designs to explore and understand diverse phenomena. The present study assessed a detailed content analysis that investigated the selection of methods developed by researchers across 30 different studies. The purpose is to offer valuable insights into the modern landscape of research methodologies, elucidating the dissemination and predominance of qualitative, quantitative, and mixed methods.

Table 4. Methodologies of the related publications.

Research Method	No.	Percentage
Quantitative	10	33%
Qualitative	15	50%
Mixed	5	17%
Total	30	100%

The table demonstrates the distribution of research methodologies employed in studies related to teaching English language in engineering departments. These approaches are classified into three primary categories: qualitative, quantitative, and mixed methods. Qualitative research methods are at the top of the list, with the greatest number of studies employing this approach, consisting of 15 articles, forming 50% of the total. Quantitative methodologies are illustrated with 10 articles, accounting for 33% of the studies. Finally, 10 studies, representing 17% of the total research articles, used mixed methodologies integrating qualitative and quantitative approaches.

This breakdown provides insights into the methodological preferences evident in studies concerning English Language and engineering. The preponderance of research falls within the qualitative category, indicating a substantial emphasis on in-depth exploration, interpretation, and comprehension of the subject matter. While quantitative methods are present, their usage is comparatively less extensive. Integrating both quantitative and qualitative elements, the mixed methods approach is employed in a moderate proportion of studies. This data establishes a foundation for further examination and interpretation of the research landscape in this particular field.

The dominance of qualitative research in the realm of English language within engineering, as evidenced in 15 out of 30 conducted studies, can be attributed to various factors. Firstly, qualitative methods prove highly effective in investigating intricate and context-specific phenomena, enabling researchers to

delve into the subtleties of language utilization in engineering contexts. Qualitative research facilitates a comprehensive grasp of subjective experiences, attitudes, and perceptions of individuals, offering particular value in educational settings.

Secondly, the inclination towards qualitative approaches in this field may stem from the compatibility of such methods with the nature of the research questions at hand. Specifically, qualitative methods prove adept at examining the influence of factors like language barriers, pedagogical strategies, and cultural influences on the dynamics of learning and teaching English in engineering. Lastly, the qualitative paradigm provides flexibility in data collection, frequently integrating methods such as interviews, focus groups, and observations. This adaptability is particularly advantageous when navigating diverse and dynamic environments, such as engineering classrooms or collaborative projects.

5. Conclusions

This content analysis study explores the distribution of studies related to teaching English in engineering departments, considering various aspects such as the number of authors, publication years, countries of study, and methodologies employed. Notably, the research landscape reveals a predominant contribution from individual authors, emphasizing the significance of independent exploration in this field.

Examining the temporal dimension, a notable concentration of studies occurred during the years 2020 and 2022. This temporal pattern suggests a heightened interest and perhaps a response to specific events or developments during this timeframe, underscoring the dynamic nature of research in the intersection of English teaching and engineering.

Geographically, the present study highlights Indonesia, China, and Malaysia as key contributors to research in this domain. These countries exhibit a proactive engagement with higher education, marked by substantial investments in both engineering and language education. The focus of studies in these regions signifies a concerted effort to align educational practices with global standards, reflecting an ongoing commitment to enhancing language instruction in engineering disciplines.

In terms of research methodologies, the qualitative approach emerges as the most commonly employed method. This preference suggests a recognition of the nuanced and context-dependent nature of language teaching in engineering. The qualitative lens allows researchers to delve deeply into the intricacies of instructional practices, potentially providing richer insights into effective pedagogical strategies.

Last but not least, this comprehensive content analysis not only sheds light on the distribution of studies but also provides valuable insights into the trends and preferences within the realm of teaching English in engineering departments. The prominence of individual authors, the temporal clustering of research, the geographical focal points, and the prevalence of qualitative methodologies collectively contribute to a nuanced understanding of the research landscape in this evolving field.

Declaration of Competing Interest: The author declare that he have no known competing of interest.

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