



Bridging the Gap: An ESP-Based Needs Analysis of Environmental Sciences Students in Pakistan

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ABSTRACT

This study aims to explore the English language requirements of the Environmental Sciences students at the University of Gujrat (UOG) through a needs analysis in the context of English for Specific Purposes (ESP) theory. Moreover, it investigated the extent to which the existing English language courses at UOG satisfactorily address the needs of Environmental Sciences students. It employs a mixed-method approach including questionnaires and interviews. One hundred and twenty students were approached for the quantitative phase of the study (questionnaires), and twenty students for the qualitative phase (semi-structured interviews). Descriptive statistics were analyzed on quantitative data using SPSS. Findings indicate that students have difficulty with scientific writing, oral communication, and technical vocabulary, and both teachers and students need a discipline-specific ESP course. The study recommends creating a customized English for Specific Purposes (ESP) program and highlights the need for collaborative teaching methods along with ESP-specific teacher training.

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1. Introduction

English serves as the medium of communication in international collaboration. In Pakistan, this language is crucial for students' academic and professional growth (Pervaiz, Irshad, & Yasmin, 2025; Yasmin, Naseem, & Abas, 2020; Yasmin, Sarkar, & Sohail, 2016). In recent decades, ELT approaches have shifted from general to field-specific instruction, as documented by Nooruddin and Yasmin (2019). ESP emerged in the late 1960s and became a primary approach in higher education language teaching. Environmental sciences students must develop exceptional language skills to read scientific literature, write professional reports, develop research proposals, and deliver oral presentations. Standard English language programs often do not fully meet the professional communication needs of these students. Many express difficulties in reading scholarly texts, composing field-related reports, and effectively explaining research concepts in English (Yasmin, Naseem, & Masso, 2019; Yasmin & Sohail, 2018). Since UOG offers English courses at various levels, it is important to evaluate whether these programs sufficiently address the communicative and academic needs of Environmental Sciences students. Hutchinson and Waters (1987) and Dudley-Evans and St John (1998) maintain that the success of any ESP course depends on how learners' needs are identified, including what learners already possess, what they need to know, and how they learn. Planning of suitable, motivating, and effective language teaching, including technical and scientific students, based on needs analysis. The study specifically investigated the English language needs of Environmental Sciences students at UOG and the extent to which the existing English language courses at UOG satisfactorily address the needs of Environmental Sciences students.

Though numerous research papers have investigated the potential of ESP in the fields of engineering, medicine, translation studies, psychology, and fashion design in the Pakistani context (Aslam & Irshad, 2025; Fatima & Irshad, 2025; "From Classroom to Practice," 2025; Islam & Irshad, 2025; Naveed, Irshad, & Sadia, 2025), few research papers have investigated the ESP needs of Environmental Sciences students. Moreover, the results of this study can be

beneficial for curriculum developers, language teachers, and academic policymakers at UOG and other Pakistani institutions. By identifying specific areas of gaps in students' language proficiency and course structure, the research provides practical suggestions for ESP syllabus planning. It is crucial to review the existing literature on ESP as it will provide a background of understanding the English language requirements of Environmental Sciences students at UOG. It will help identify what has already been done in the field, highlighting the gap for the current study.

2. Literature Review

English for Specific Purposes (ESP) was a distinctive offshoot of English Language Teaching (ELT) that emerged to cater to the continuously changing linguistic demands of the academic, scientific, and global working environments. Since the 1960s, the growth of science and technology, along with the increasing importance of English as a lingua franca, has created an urgent need for instruction based on discipline and profession. The English for general purposes (EGP), which is the homogenized model of the instruction of English, was not adequate to prepare English students for technical or academic environments, and this laid the foundation for ESP. ESP has become more significant in university education since then, especially in countries where the dominant language is English, and students must read academic texts, write academic essays, and communicate technical content in English. Hutchinson and Waters (1987), often considered pioneers in ESP, argued that ESP is different from General English based on the awareness of learners' needs. This observation has prompted researchers and universities across the world to emphasize needs-based syllabi, where instruction is directly connected with the communicative needs of learners' study or workplace. ESP, an approach to language teaching by developing learners' communicative competence in specific academic, professional, or occupational contexts, is generally defined as a methodology (Dudley-Evans & St John, 1998). ESP is different from general English as it is function-oriented, adaptable, and inexorably bound with the target situation in which the language will be used. Broadly speaking, ESP can be divided into English for Academic Purposes (EAP) and English for Occupational Purposes (EOP).

The study focuses on EAP, as it equips the learners with the language skills required in their academic settings, such as reading research reports, writing reports, and attending seminars. The basis of effective ESP teaching is needs analysis. Needs analysis, according to Richterich and Chancerel (1978), is the process of determining learners' language needs. These include the language skills that learners require to function effectively in their working or academic environments. Hutchinson and Waters (1987) categorize needs into three: 1) target needs – what learners need to function in the target context; 2) learning needs – how learners learn the language effectively; 3) present situation analysis (PSA) – what learners already know. By identifying the gaps between what learners already know and what they need to learn, instructors can build a more successful ESP syllabus. West (1994) posits that unless needs analysis is properly carried out, ESP courses have a likelihood of being irrelevant, inefficient, and demotivating. This is particularly applicable in the Pakistani context, where English language instruction is typically general and not related to the learners' field of study. Various studies have examined the application of ESP in scientific and technical fields. According to Flowerdew (2005), science students are faced with a range of language problems, including interpreting complex technical texts, constructing evidence-based arguments, and utilizing technical lexicon and grammatical patterns. None of these problems were addressed in conventional EGP courses, and more discipline-specific language teaching is needed for them. Hyland (2006) emphasized the genre-based method to ESP for science students and recommended including instruction that prioritized scientific conventions of communication and writing.

In the Pakistani context, Mansoor (2005) and Rahman (2004) identified that science and technology students had found English extremely difficult, which in turn influenced their learning achievement. They highlighted that most universities continued to follow a general English policy without considering the discipline-specific language demands of the students. Mahboob (2007) emphasized that ESP courses must be tailored to the particular linguistic, academic, and cultural needs of Pakistani learners. Unlike Hyland, Mahboob did not propose the subject-specific instructional models. These studies highlight that numerous studies on ESP have been done in various fields in the Pakistani context; however, there remains limited research focusing on Environmental Sciences students. Environmental Sciences is an interdisciplinary degree, and its English language requirements for students are vast and complex. However, comparatively little work has been done to explore how English instruction can be adapted to meet these requirements in Pakistani institutions such as the University of Gujrat. Environmental Sciences

is an interdisciplinary field that integrates scientific, technical, socio-political, and ethical dimensions. Given that environmental science is a field of fabrication, students and professionals in environmental science need to be able to read and write research articles, interpret data, give presentations at meetings, and participate in the policy process. The English language proficiency required for these functions is quite high, specifically in reading, academic writing, and spoken communication. The environmental discourse is done primarily on the international level in English. There are international conferences, journals, treaties such as the Paris Agreement, and global organizations, including the IPCC or UNEP, that operate largely in English. Thus, for students from countries like Pakistan, where environmental challenges are both prevalent and trending, proficiency in these discourses is required.

3. Research Methodology

A mixed-methods approach was used to analyze the English language requirements of Environmental Sciences students at UOG. Combinations of both qualitative and quantitative research design techniques are used, providing triangulation and verification of results as emphasized by Hutchinson and Waters (1987) and Dudley-Evans and St John (1998). Thus, to capture the complex nature of language requirements in an academic environment, two main instruments- a questionnaire and interviews- were designed. This research design is suitable as it helps analyze the quantitative aspects of the students' needs while also analyzing less quantitative aspects, such as attitudes, motivation, and individual learning experiences, which may be overlooked in strictly quantitative studies. The sample population for this study was undergraduate students and faculty members from the Environmental Sciences department at the University of Gujrat. 120 students were approached for the quantitative phase of the study (questionnaires), and 20 students for the qualitative phase (semi-structured interviews). The sample of 120 students would ensure that the results of the study are reliable. The research in education recommends a sample size of more than 100 participants as usually sufficient to obtain stable descriptive statistics and minimize the sampling error (Creswell & Creswell, 2017).

The students were chosen from various academic levels (2nd to 8th semester) to cover a wide range of experience and exposure to the English language use in academic environments. To ensure representation from all semesters, stratified random sampling was used to conduct the student survey. Moreover, the interviews used purposive sampling to choose participants, selecting three interviewees in accordance with their proficiency in English (high, medium, and low), and ability (high, medium, and low academic achievement), in order to allow for richer and more varied perceptions of data through qualitative analysis. Furthermore, in order to include an institutional and instructional point of view, six faculty members were interviewed. These faculty members were chosen based on their availability and teaching experience. They provided information on observed problems in students' use of language and recommendations for improving ESP courses. The questionnaire was divided into five sections: 1) demographic information, 2) current use of English, 3) importance of language skills, 4) perceived needs and challenges, and 5) open-ended suggestions. Most of the items employed a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), whereas a few open-ended questions were provided for explanation. A pilot study was conducted with a small number of Environmental Sciences students to ensure the questionnaire's reliability. Internal consistency was evaluated using Cronbach's alpha. Furthermore, to ensure content validity, two faculty members from the environmental science department were requested to review the questionnaire and interviews. These processes helped ensure the consistent and accurate measurements of the constructs. The research also established ethical considerations of the study, as all participants were made aware of the purpose of the research, assured of confidentiality, and written informed consent was taken from every participant before participation.

4. Data Analysis

This section presents an analysis of the data collected from questionnaires and semi-structured interviews. The research covers the particular English language needs of Environmental Sciences students of the University of Gujrat. Moreover, the study also analyzes their current proficiency, domains of difficulty in academic communication, and students' perceived usefulness of the English language course.

4.1. Analysis of Questionnaire Data

One hundred twelve answers were received from undergraduate students in the Environmental Sciences department. Descriptive statistics were analyzed on quantitative data through SPSS. The findings were categorized under the domains of language proficiency, frequency of usage, importance of the skills, perceived difficulties, and recommended improvements.

4.1.1. Current English Language Proficiency

In the four general language skills of listening, reading, writing, and speaking, the students were asked to assess their abilities and answer the questions using a five-point scale. The results are given in Table 1.

Table 1: Current English Language Ability

Skill	% Beginner	% Intermediate	% Advanced
Reading	20%	62%	18%
Writing	28%	58%	14%
Listening	24%	61%	15%
Speaking	32%	54%	14%

Most learners are at the intermediate level in all the skills, with reading standing at 62%, writing at 58%, listening at 61%, and speaking at 54%. Most learners, 32 % of the respondents, tend to find speaking more difficult, followed by 28% writing, 24% listening, and 20% reading. Conversely, the advanced level has the lowest percentages in all the skills, with reading being 18%, listening being 15%, and writing and speaking both being 14%, which indicates that fewer students have reached a high level of proficiency, especially in productive skills. These numbers show that most students identify themselves as intermediate English users, having comparatively lower language skills in speaking and writing than in reading and listening. The results conform to earlier research (e.g., (Mansoor, 2005), which has shown Pakistani science students having difficulty with productive skills because they have fewer chances of real-time communication and formal writing practice.

4.1.2. English Usage: Frequency and Context

Students were asked to what extent they used English in different learning environments. The most frequently used English reading materials reported by students included English textbooks (78%). However, a few indicated that they used English frequently for writing assignments or reports (36%), while 42% stated that they never participated in English-language discussions or presentations. This knowledge considers a key disparity between the receptive and productive use of language. Reading is being instructed due to the content-based character of the study material, and there is no opportunity for students to have in-class practice with writing and speaking. This finding indicates that ESP teaching tasks, through which students will be able to accomplish all four skills of language use, are particularly effective through task-based teaching.

4.1.3. Role of Language Skills

Students ranked the importance of different language skills for their future study and professional career. Table 2 shows the percentage of respondents rating each skill "Very Important".

Table 2: Role of Language Skills

Language Skill	% Rating as "Very Important"
Reading scientific texts	85%
Writing lab reports and assignments	80%
Listening to lectures	72%
Speaking in discussions/presentations	68%
Using technical vocabulary	88%

The results in Table 2 confirm that reading (85%) and use of technical terms (88%) are considered the most critical skills. Writing also ranked high, with an 80% rating, particularly in reports and thesis writing. On the other hand, speaking at 68% and listening at 72% received comparatively low ratings.

4.1.4. Perceived Gaps and Challenges

Students were requested to rate the extent to which they agreed with statements about their existing English courses and the difficulties that they experienced.

Table 3: Perceived Gaps and Challenges

Statement	% Agree/Strongly Agree
I require additional training in scientific writing.	84%
I have trouble with technical terms.	73%
The existing English courses are not field-specific.	81%
I find it difficult to speak English fluently in academic situations.	76%
I want help from the ESP course for Environmental Sciences.	89%

A substantial number of students (89%) agree or strongly agree that an ESP course specific to their field of work would be useful. In addition, 84% state that there is a need for extra training in scientific writing, an area that is deficient in current instruction. 76% of students struggle with speaking fluently in academic situations, and 73% struggle with technical vocabulary. In addition to this, 81% of them also think that the current English courses lack field relevance, highlighting a call for more specialized and field-oriented language courses. These findings suggest that students are not satisfied with the existing English curriculum, highlighting its unsuitability for their study needs. A striking aspect is students' failure to write effectively in science and present themselves in oral tasks, as these are crucial fields in Environmental Science studies, where fieldwork presentations and reports on lab experiments are routine matters.

4.1.5. Course Improvement Recommendations (Open-ended response)

Students were asked to provide recommendations for designing an ESP course for environmental studies students. Students highlighted that their courses lacked subject-specific vocabulary and recommended the inclusion of technical and subject-based word lists that could make them confident in learning skills, as one student demanded to provide them "more vocabulary, science, and environment." Moreover, another student highlighted the need to include instructions on article writing. He was of the view that "teach us how to write research papers and reports." This indicates the need to shift towards explicit instruction regarding the style and structure of article writing to prepare the students for formal written texts. Furthermore, students recommended the need for applied, contextualized, discipline-specific material over isolated grammar exercises or irrelevant reading excerpts, as they believe that "instead of the usual grammar, use real case studies or reports". This aligns with the need for ESP, emphasizing the teaching of meaningful content.

4.2. Interpretation of Interview Data

Twenty students and six faculty members were interviewed. Thematic analysis of interview transcripts yielded several salient themes.

4.2.1. Student Perceptions

The following section highlights students' perceptions regarding the irrelevance of current English courses, their lack of confidence in speaking and writing, and their motivation and interest in ESP.

a) Irrelevance of Current English Courses

Current compulsory English courses, for example, always featured general grammar and literature, with very little relevance to their field, as students claim: "teachers teach us essays and short stories that are not helpful to reading scientific texts, or reading environmental reports" (Student, 6th semester), and "we are not yet learning to write applications; however, we need to learn to write term papers." (Student, 4th semester). These statements support the quantitative results that students need more focused teaching on the types of writing and reading assignments relevant to their fields.

b) Speaking and Writing Confidence Issues

A few students identified that they felt unsure while expressing themselves in English during presentations or class discussions: "I get lectures, but when I speak, I am stuck. I am unable to say it in the way I desire" (Student, 3rd semester); "I don't know what the format to use and the right words to say, so it is difficult to write lab reports" (Student, 5th semester). This

indicates the need for guided practice in oral and written skills, relevant to Environmental Sciences fields.

c) Motivation and Interest in ESP

Surprisingly, despite these challenges, students were extremely motivated to learn English if the topic was relevant, as one student claims that "If we learn environmental subjects in English class, we learn more and also learn language." (Student, 2nd semester). This motivation is fertile ground upon which ESP curriculum developers can build to involve students more effectively.

4.2.2. Faculty Views

a) Gaps in Student Communication Observable

The teachers stated that students struggled to provide clear explanations of scientific concepts in English, particularly in written tests and oral presentations. One faculty member posits that "students have the information but are unable to present it in a well-structured, coherent manner." This also confirms the view that ESP is not only concerned with language accuracy but also with discourse structure and clarity of expression.

b) Disconnection Between English Courses and Field Needs

The English faculty agreed that the institutional systems that regulate academic programs do not meet the needs of disciplines, as one faculty member maintains that "we teach the same syllabus to all departments. There's little room to adapt materials to science students". This suggests that there are systemic issues that hinder the development and implementation of focused ESP courses. The above analysis of the interview results highlights that students pointed out the issue of irrelevant and inappropriate content, whereas the teacher focused on weak communication skills and institutional constraints.

5. Findings

The results of the interview and questionnaire intersect at various underlying points:

1. The students accept that English has its importance for them in academic as well as career progression, particularly while reading and writing scientific writing.
2. There exists a vast mismatch between the present curriculum of English and actual English language tasks included within the discipline of Environmental Sciences.
3. Students feel inadequate to write scientific reports and communicate in academic environments, which dissuades them from contributing and performing.
4. Teachers recognize the language problems of students and support a collaborative, context-based way of teaching language.
5. There is a perceived need for an ESP course that is relevant to the communicative tasks, vocabulary, and genres of Environmental Sciences.

These findings align with international research highlighting the importance of ESP in bridging the gap between general language aptitude and the needs of higher education (Basturkmen, 2014; Flowerdew, 2012). At a local level, these findings validate scholars' perspectives, supporting more functional, task-oriented teaching of English at Pakistani universities (Rahman, 2004). The results of the research show that Environmental Sciences students at UOG need to improve their reading and writing skills for academic performance and oral communication skills for professional performance. These findings are in line with the ESP framework that was developed by Hutchinson and Waters (1987), which notes that the needs of learners should be analyzed in terms of target situation analysis (what students need to do with language in future academic and professional situations) and present situation analysis (what the current level of student proficiency is).

6. Discussion and Conclusion

The study explored the specific English language needs of Environmental Sciences students at UOG in the academic context. Moreover, it investigated the students' perceptions of their current mastery of English proficiency, and the extent to which the existing English language course addresses the needs of Environmental Sciences students. The results revealed a gap between existing English language coursework and the actual scholarly and professional English communication needs in the Environmental Sciences discipline. Students faced challenges in scientific writing, oral communication, and acquiring technical vocabulary. Both students and

tutors agreed that current English courses are generic and do not help learners develop the specific language skills needed to succeed in their careers. Despite these issues, students expressed a strong desire to learn and improve their English skills if instruction were practical and functional. This clearly indicates a need for an ESP curriculum that directs the profession toward a field-oriented and well-structured approach, which is both justified and timely (Anthony, 2018). These findings indicate that an ESP curriculum must be both situational and disciplinary. Hutchinson and Waters (1987) also highlighted the importance of conducting target situation analysis and current situation analysis to ensure that course design addresses the learners' needs. The specialized reading materials, writing tasks based on scientific genres, and oral communication opportunities in professional situations, including presentations and seminars, must be included in future curriculum development. Implementing the above-discussed recommendations can bridge the gap between general language teaching and subject-specific communication requirements. Ultimately, equipping Environmental Sciences students with English language skills will enhance their performance, boost their confidence, and enable them to actively contribute to national and international environmental discussions. The study has practical implications as it encourages universities to integrate ESP-based courses for Environmental science students, and urges policymakers to provide funds and train teachers to teach ESP courses effectively.

6.1. Limitations and Future Research

Although this study is useful in providing information on the English language requirements of students of the Environmental Sciences discipline at UOG, it is not without limitations. First of all, the sample was restricted to a department in one university, and this could have been applied in other fields or in other universities in Pakistan. Second, the students could have been biased in their responses as they themselves had filled out the questionnaires. They may overestimate or underestimate their language needs. Third, though faculty interviews can be considered helpful in providing a qualitative understanding, the small number of faculty respondents may not be a complete representation of the diversity of opinions across the department. In the future, there is a need to collect data from Environmental Science students of other Pakistani universities to get a broader understanding of these students across Pakistan. Moreover, classroom observations and the analysis of students' written work could provide an objective understanding of their actual language use and demands.

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